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Psychological Bulletin

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Psychological Bulletin

MULTIPLY, VARY, LET THE STRONGEST LIVE AND THE WEAKEST DIE—CHARLES DARWIN[1]

BY CALVIN P. STONE
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Even in remote times naturalists attempted to explain the origin and significance of diversity of instinctive behavior in animals. It was obvious to them that inherited patterns of behavior in bees and moths, songbirds and vultures, bears and hunting dogs were discontinuous phenomena. But how to account for discontinuity was indeed a baffling problem for the ancients; and so it is for scientists of the present day.

In 1842, the birth year of William James, whose life and work we are commemorating in the annual meeting of our Association, there were two widely held conceptions of the origin of diversity of instinctive behavior: *special creation* and *gradual evolution by the inheritance of adaptive habits.*

Special creationists generally regarded the species as immutable or permanent types. Major lines of diversity were assumed to have been created at the beginning of life on earth, or in successive eras thereafter, and minor diversities were ascribed to special circumstances of life which allowed individuals only in limited degrees to realize the fundamental characters of the species to which they belonged. Although the first half of the 19th century was not wholly free from dissenters from the foregoing conception of origin, it was lacking in variety of competing hypotheses which gave promise of unifying the legitimate speculation, hypotheses,

[1] Presidential Address for the Fiftieth Annual Meeting of the American Psychological Association. Because of the cancellation of the program of scientific papers scheduled for Boston and the substitution of a "skeletonized" business meeting in New York City in response to the request of the Office of Emergency Management that meetings be postponed for the duration of the war, this address, originally scheduled for Friday, September 4, 1942, was not delivered orally.

and facts of observation of that time. Quite appropriately the special creation theory was characterized as one that was "easy to scotch but hard to kill."

About 1801 Lamarck (17) made the inheritance of learned responses a basic postulate in his theory of gradual evolution of diversity in instincts. And so skillfully did he employ this postulate later on (1809) in the biological classic "Philosophie zoologique" to organize the available facts bearing on gradual evolution that his account temporarily overshadowed the earlier evolutionary theories of Buffon, St. Hilare, and Erasmus Darwin. It commanded the respectful attention of leading scientists on the continent, in Great Britain, and in the United States during three quarters of the 19th century. Spencer used it, Carpenter accepted it, Wundt endorsed it. Even Weismann who later sounded the death knell of this Lamarckian postulate actually countenanced it as late as 1880.

Lamarck assumed that all of the organisms of his time had descended from minute germs, the smallest and simplest of living matter, and that these germs were the product of spontaneous generation. As a general rule, behavioral patterns developed from the simple to the complex but under certain conditions progress was arrested and regressions set in. Basic was the assumption that circumstances of the *milieu externa* create in animals possessing a nervous system all of the fundamental "needs" (*besoins*) or "wants" relating to food, fecundation, avoidance of pain, and attainment of pleasure or happiness; and these, in turn, arouse adaptive movements which alleviate the needs. Changes of the living conditions regularly create new needs, or cause the alteration and disappearance of former needs thereby invoking disuse, waning and ultimate disappearance of adaptive movements, habits, or instinctive acts which had been functionally associated with them.

It naturally followed that whenever, for a considerable period of time, a group of closely related animals was isolated and subjected to circumstances of life (climate, geographical barriers, enemies, competition for space or food, etc.) which differed considerably from those to which the parent stock had been standardized in behavioral adaptations, a succession of variations eventuating in noticeable diversity would appear. Acting over only a short period of time, the altered circumstances would produce such minimal changes as one now observes between varieties

within a species and, over geological eras, such gross differences as are observable in our time between contemporary orders, genera, and classes. When external circumstances are relatively stable for a long period of time the individuals of a species living in close proximity eventually acquire approximately the same repertoire of adaptive habits. By virtue of this, when viewed in man's life-span, they may appear to be invariable from generation to generation and thus provide the illusion of immutability of species.

Lamarck assumed that slowly developed adaptive habits are changed into hereditary behavioral characters, which thereafter are transmitted from parent to offspring without the necessity of tuition or individual learning. The newly "acquired" instincts are subsequently modified by further additions and subtractions, each of which serves the biological end of adapting individuals or species to contemporary conditions of life. Thus one may regard each complex instinct of bees and moths, songbirds and vultures, bears and hunting dogs as the end-product of a finite number of successful adaptations made in the history of the species. Granting to Lamarck unlimited time and unlimited capacity in animals for the organization of adaptive movements which later become hereditary characters, we can hardly imagine a degree of instinctive specialization too complex to be accounted for by his theory of evolution.

But just how adaptive responses, individually learned, became transmissible by "generation"[2] was only superficially explained by Lamarck, this enigma of our day being passed over then as if only a commonplace fact of observation not worthy of prolonged discussion. Without questioning, he assumed that habits which have become stereotyped and well nigh invariable with practice in their use, which run their course without apparent conscious direction as human automatisms are perceived to do, and which tend similarly to appear in individuals of a group living together, are the *veritable* essences of hereditary characters.

Lamarck did not deal systematically with the interrelationships of homeostatic mechanisms as did Claud Bernard in the sixties or Walter B. Cannon in the past two decades. He did not clearly distinguish between agencies which initiate changes in the instincts of a species and those which bring to fruition in the in-

[2] The term "generation" is roughly equivalent to our concept of sexual reproduction. In Darwin's time "congenital" was an alternative for hereditary.

dividual, in sequential order, the distinctive innate characters which differentiate between young and adults, adults and old, males and females, or the like-sex workers and queens among the bees and the ants. He said little to stimulate detailed study of the interplay of instinctive activities in animal populations, a topic more thoroughly understood by later workers, particularly the founders of the science of animal ecology. Nevertheless, Lamarck did psychobiology a service by according to behavioral evolution a place no less prominent than form and structure, an evaulation no one has rejected. He asserted with emphasis that behavioral adaptations are necessary forerunners or accompaniments of structural changes, the latter resulting from use and disuse of existing parts of the body. By attending to co-variations of adaptive movements and structural adaptations he was able to envisage a closely interwoven causal nexus in which the evolution of well-nigh countless correlated structures, forms, and instinctive acts has occurred in bygone eras (and may be occurring today), these having interrelations which hitherto had baffled the understanding of every naturalist who had witnessed and described them. Lamarck perceived and convincingly argued that no theory of descent could win adherents unless it gave a plausible account of the evolution of animal instincts. Probably more than any other scientist before his time he set the stage for fundamental speculation, observation, theorizing, and research on the origin of diversity in instinctive behavior. This has been a major interest of leading evolutionists during the past one hundred years.

The Evolution of Instincts by Natural Selection

A relatively independent point of view concerning the evolution of instincts began to take shape in the mind of Charles Darwin in 1842, the year of William James' birth. Referring to the earliest formulation of his views he says, in his autobiography (6), "In June 1842 I first allowed myself the satisfaction of writing a very brief abstract of my theory in pencil in 35 pages; and this was enlarged during the summer of 1844 into one of 230 pages, which I had fairly copied out and still possess." His son, Francis, who published these manuscripts in 1909 says that the 1842 paper "only came to light after my mother's death in 1896 when the house at Down was vacated. The Mss. was hidden in a cupboard under the stairs which was not used for papers of any value but rather as an overflow for matter which he did not wish to destroy" (7).

Doubt as to the immutability of species had not seriously occupied Darwin's mind prior to his voyage on the Beagle and the years immediately afterward (1837–39) when he was arranging and interpreting the observations made by himself and other scientists who reported on this voyage. So omnipresent had been behavioral variations in whatever instincts he chose to observe that it seemed he had only to discover rigorous selecting and isolating agents, capable of summating similarly oriented variations for a long period of time, to account for a degree of diversity equalling that found in local races of well-known species or in related species inhabiting islands which once were connected with the mainland.

By 1842 he had no doubt as to the demonstrability of ever-continuing variations in the instinctive behavior of all extant species living under conditions of domestication or in the feral state. And so far as he then could determine, *a priori*, there was no law of nature which limited the kind, the direction, the amount, or the perpetuity of variation in instinctive behavior. Already he had arrived at the conclusion which prompted him to say, in the first edition of the "Origin,"

> . . . it may not be a logical deduction, but to my imagination it is far more satisfactory to look at such instincts as the young cuckoo ejecting its foster-brothers,—ants making slaves,—the larvae of *Ichneumonidae* feeding within the live bodies of caterpillars,—not as specially endowed or created instincts, but as small consequences of one general law, leading to the advancement of all organic beings, namely, multiply, vary, let the strongest live and the weakest die (**4**, p. 244).

1. *Scope and limitation:* Darwin did not attempt in the first enunciation of his views to account for the "first origins of instincts and other mental attributes." He desired only to show how diversity could possibly have occurred in the great groups of animals of his day. He spoke, for example, of such instinctive acts as we commonly designate by the terms *fear*, *timidity*, and *wildness;* of those conditioned by diurnal or seasonal states of the body such as sleeping, hibernation, migration, and fecundation; of consensual movements such as pacing or trotting, erratic flying of "tumbler" pigeons, and pointing and shepherding in certain breeds of dogs; and of the so-called "industries" of animals, such as spinning of cocoons by insect larvae, fabrication of nests by weaver birds, erection of dams by beavers, construction of diverse kinds of cells by bees and wasps, and complicated family routines of the social insects pertaining to nursing, feeding, and the defense of young. These and others not enumerated could vary in respect to detail

of pattern, strength and perseverance, age at first appearance, latency or patency in successive generations, dependence on experience for normal development, or susceptibility to modification by tuition and the particular life situations for which the true instincts were not suited.

2. *Definition.* He perceived the difficulty of formulating a precise definition of instinct. While reminding himself in the 1842 essays[3] to define instinct, he merely discusses some of the important items the concept should entail. The context, however, indicates that he intended it to embrace (1) the more corporeal unlearned activities of animals which obey the same laws of transmission as structural traits when fertile races or interfertile species or genera are hybridized, and (2) complex acts in which the motivating impulse arises from conditions having an hereditary base, but in which quite variable details of behavior might appear as, for example, the migratory journeys of birds or reindeer.[4]

In the "Origin of Species" (1859), Darwin again avoided defining instinct on the ground that everyone understood what the term meant when it was used in a specific instance. Continuing, he says:

> An action, which we ourselves should require experience to enable us to perform, when performed by an animal, more especially by a very young one, without any experience, and when performed by many individuals in the same way, without their knowing for what purpose it is performed, is usually said to be instinctive. But I could show that none of these characters of instinct are universal. A little dose, as Pierre Huber expresses it, of judgment or reason, often comes into play, even in animals very low in the scale of nature (**4**, p. 207).

With this conception, which was not entirely original with him, he was never satisfied, nevertheless he retained it unaltered in each

[3] In the 1842 essay he jotted down the words "Lord Broughham's definition" at a point where his own conception must have been in mind. But it is doubtful whether he expected to quote this definition, for in expanding this section later he merely says that "Lord Broughham insists strongly on ignorance of the end proposed being eminently characteristic of true instincts" (**7**, p. 117). It would seem that the jotting was to remind him to say that, in respect to ignorance of end, acquired instincts (habits which have become hereditary) differ in no essential way from the true instincts which are summations of variations naturally occurring in animals living in the feral state.

[4] I shall not deal with this aspect of the problem today. The subject received considerable attention at the hands of Romanes, Lloyd Morgan, and animal biologists during the last quarter of the nineteenth century. In the period beyond 1920 interest has been revived in the topic by students of animal migrations and also by those working in the field of animal drives.

revision of the "Origin," the last being completed in 1872. Although later authors have emended and possibly improved upon this basic idea, no one so far has been able to define the term in a manner satisfactory to all who have occasion to use it. The multiplication of diverse phenomena embraced by the word *instinct* has made it one of the most uncertain and abused words in the lexicon of psychological terms during the past 100 years. And recent attempts to banish it from general usage have accomplished little by way of freeing our science from the dilemma of multiple meanings. Unfortunately, these attempts are working to our disadvantage by diverting the attention of young researchers from a wealth of behavioral phenomena which are known to have great, although as yet not fully evaluated, theoretical and practical implications.

Variation

Darwin foresaw the necessity of accounting as fully as possible for all behavioral variations that could possibly have contributed significantly to divergence from one or a few parent stocks. Variations were the building stones of evolution theory then, as they are today.

Believing that most variations in habits due to short-term influences, such as food deprivation, illness, injury, or exposure to heat or cold, were rarely if ever transmitted by "generation" and therefore could have had but little weight, he dismissed them as a class from consideration. A high degree of conjecture and arbitrariness on his part gave rise to inconsistencies and no small degree of confusion among those who regarded him an authority.

Although then unable to decipher the basic distinctions between the acquisitions belonging to the somatoplasm and those belonging to the germ plasm, as did Weismann and others in the eighties, he had no doubt as to the gonads playing an important if not essential role in the transmission of hereditary characters. While psychobiologists have been in essential agreement with this early conclusion, they dared not accept his judgment as to what individually developed responses originally had or later attained hereditary status. Darwin always was a very unreliable prophet on this point, as also were some of his followers during the latter third of the nineteenth century.

In these early essays he discussed chiefly two kinds of variation which could possibly have been the sources from which diversity in instinctive behavior arose: namely, (1) Differential habit forma-

tion, to which adhered the belief that some habit variants which fortuitously have adaptive value in the struggle for survival and are slowly acquired may attain hereditary status, and thereafter be passed from parents to offspring as "acquired" instincts without the necessity of practice; and (2) Gross hereditary variations of the saltatory type, known in his time as "sports," and small hereditary variations some of which are so minute as to require summation in successive generations before becoming noticeable to naturalists or animal fanciers. He desired to explain the diversification of instincts so reasonably that no thoughtful sceptic would reject the "theory of common descent of allied organisms from the difficulty of imagining the transitional stages in the various now most complicated and wonderful instincts." In so doing he gave about equal weight to the inheritance of learned responses and to hereditary variations. The following quotations reflect his views:

> . . . almost infinitely numerous shades of disposition, of tastes, of peculiar movements, and even of individual actions, can be modified or acquired by one individual and transmitted to its offspring. . . . The inherited paces in the horse have no doubt been acquired by compulsion during the lives of the parents: and temper and tameness may be modified in a breed by the treatment which the individuals receive (**7**, p. 115).

> The "transandantes" sheep in Spain, which for some centuries have been yearly taken a journey of several hundred miles from one province to another, know when the time comes, and show the greatest restlessness (like migratory birds in confinement), and are prevented with difficulty from starting by themselves, which they sometimes do, and find their own way. There is a case on good evidence of a sheep which, when she lambed, would return across a mountainous country to her own birth-place, although at other times of year not of a rambling disposition. Her lambs inherited this same disposition, and would go to produce their young on the farm whence their parent came; and so troublesome was this habit that the whole family was destroyed (**7**, p. 114).

> I will briefly consider . . . one other class of instincts, which have often been advanced as truly wonderful, namely parents bringing food to their young which they themselves neither like nor partake of;—for instance, the common sparrow, a granivorous bird, feeding its young with caterpillars. . . . We may suppose either that the remote stock, whence the sparrow and other congenerous birds have descended, was insectivorous, and that its own habits and structures have been changed, whilst its ancient instincts with respect to its young have remained unchanged; or we may suppose that the parents have been induced to vary slightly the food of their young, by a slight scarcity of the proper kind (or by the instincts of some individuals not being so truly developed), and in this case those young which were most capable of surviving were necessarily most often preserved, and would themselves in time become parents, and would be similarly compelled to alter their food for their young (**7**, p. 126).

Once grant that dispositions, tastes, actions or habits can be slightly modified, either by slight congenital differences (we must suppose in the brain) or by the force of external circumstances, and that such slight modifications can be rendered inheritable,—a proposition which no one can reject,—and it will be difficult to put any limit to the complexity and wonder of the tastes and habits which may *possibly* be thus acquired (7, p. 126).

1. The "acquired" instincts. Whether Darwin had any misgivings in asserting that certain habits attain hereditary status cannot be determined from his earliest writings, but I am inclined to believe that he did not. The idea was not new. For almost a quarter of a century scientists had freely utilized it. Hence, he had no reason to fear that criticism of this assumption would "backfire" on the theory of descent, which it was intended to support. A few years later, quite independently, Spencer employed the idea without apology in his account of the compounding of reflexes to form new instincts or to alter the old ones. The method of compounding described was simple associative learning, in which contiguous factors of the external environment cause simple reflexes to be repeated again and again in particular orders and temporal spacings. Somehow, with many repetitions, these associated reflexes become fixed as hereditary compounds and are thereafter transmitted from one generation to another without the necessity of practice or repetition.

After some experimentation on pigeons and further consideration of facts collected from other sources, Darwin was disposed to de-emphasize the importance of "acquired" instincts as compared with hereditary variations. This was apparent in 1859, in the first edition of the "Origin of Species" and albeit with some wavering it continued for several years thereafter. Nonetheless he attempted to develop a provisional hypothesis that would serve several purposes, one of which was to explain the mechanism whereby habits can attain hereditary status. This he published (5) in 1865 under the name *pangenesis*. Today pangenesis has only historical significance; but in the sixties and for about three decades thereafter it served as a unifying principle for the coordination of a multiplicity of discordant beliefs and facts of observation.

This theory, so far as it applies to behavior, stipulates that every cell of the body, in every stage of life, discharges into the circulation minute particles or gemmules. The latter multiply by fission, at the same time preserving their essential characteristics and congregating in the gonads, particularly in the sperm and the

ova. They mingle but preserve their identities at the time of fertilization and thus provide a liaison mechanism between parents and offspring. The gemmules have an affinity for nacent cells of the type which originally produced them and exert a controlling influence upon their proliferation and activities so as to cause them to recapitulate forms and functions which were characteristic of, or even peculiar to, the parents at specific ages. Assuming that cells of the nervous system mediate all adaptive movements, it naturally followed that the nerve cells responsible for specific habits in the parents would pass on to the offspring a heritage of gemmules capable of instating in these young a specific response or a repertoire of parent-like responses. No practice was required in typical instances and, since the gemmules were presumed to act at precisely the same age in the offspring as that in which the habits were developed in the parents, he could thus explain the origin of temporal and serial schedules which the instincts follow in their initial manifestation. Obviously the annexation of "acquired" instincts at any point on the life line, from the embryo to the aged, provided one of the most fertile sources of variation with which selective and isolating agencies could operate to produce some of the kinds of diversity present in our day.

To give full details of the workings of gemmules is not our intention. Suffice it to say, however, that this ingenious theory of the mechanism of transmission of learned responses was applicable also to the modification and transmission of true instincts. Furthermore it offered an explanation of latent instincts, reversion, blending, saltation, and dominance. The list is not exhaustive. Even the difficult case of graniferous sparrows which fed their young on larvae which they neither ate nor liked for themselves yielded to pangenesis. It was truly an all-purpose theory, directed to the inscrutable as well as the orderly processes of "generation."

In the mind of Darwin, pangenesis was only a provisional theory. It should stand or fall by the force of evidence submitted for and against it. He had not long to wait because in 1871 his cousin Francis Galton (11) devised an experimental method by which to put it on trial. He transfused the blood of one race of rabbits with distinctive morphological and behavioral characters into another that had noteworthy differences in homologous characters. Then, as soon as possible, he bred the recipients of the foreign blood to animals of their own race and awaited the appearance of characteristics of the blood donors in offspring from these

matings. He assumed that gemmules from the blood of the donors would find their way into the sperm and/or ova of the hosts and thence into the offspring where they would exercise their usual functions in the manner hypothecated by Darwin. Not a single offspring in a rather elaborate series of tests showed behavior or morphological characters which deviated in the direction of the donors of blood. While not a perfect test of the theory, as Galton admitted, these experiments nevertheless had some weight on the negative side of the ledger. In 1875, Galton (**12**) published an alternative theory of heredity in which he assigned to the germ cells full responsibility, without aid of gemmules from the somatoplasm, of transmitting hereditary characters from parents to offspring. This paper denied the possibility of learned responses attaining hereditary status and thus altogether eliminated the "acquired" instincts from consideration. Eight years after this paper appeared Weismann gave substantial support to Galton's point of view in his epoch making treatise on the continuity of the germ plasm. This placed a stricture upon the Lamarckian hypothesis that on *a priori* grounds made it unacceptable to many scientists immediately thereafter.

Among certain men, however, the theory of pangenesis or derivatives therefrom continued to flourish, and further experiments were designed to put it under stress, among them being experiments relating to telegony. The upholders of telegony believed that the blood of a female which bore a hybrid offspring became contaminated ("infected") during the gestation period with the result that this condition would give to subsequent pure-line offspring some of the characters of the hybrid. Thus an equine colt borne by a mother which the previous year had borne a mule-colt would have mulish characteristics; a pedigreed bitch if allowed to produce a litter by a mongrel sire would, when next mated to a pedigreed male of her own breed, bear one or more pups resembling the mongrel. Against this popular conception the celebrated Penycuik (**9**) experiment provided telling evidence. Equine mares were mated with a zebra stallion and allowed to rear hybrid offspring; then followed matings of the same mares with equine stallions. The behavioral traits of wildness, viciousness, and excitability of the zebra should have appeared in the equine foals, but none of them did. Bearing indirectly on telegony is the classical experiment of Heap (1890) in which two fertilized ova of the Angora breed of rabbits were introduced into the Fallopian tube

of a Belgian hare (**13**). These fertilized eggs developed into normal Angora rabbits which in no way appeared to deviate from the characteristic features of their true parents. Finally, in 1902 telegony was conclusively disproven by Darbishire (**3**) in a systematic study of the whirling tendency in "dancing" mice. Non-whirling mothers which had borne offspring begotten by dancer males were subsequently mated to non-dancer males. In no instance did whirlers appear from these matings.

Darwin personally supplied only inferential evidence in support of the inheritance of learned responses and for many years only anecdotal evidence was supplied by others. In the seventies, however, Brown-Séquard reported behavior data which were interpreted as giving it support. He described a small number of epileptic convulsions in guinea pigs which were the offspring of parents in which epileptic convulsions had been produced experimentally by lesions in the spinal cord or in the sciatic nerve. A few years later Romanes repeated these experiments with only here and there a result that supported the claims of his predecessor. Neither of these studies was convincing to careful experimenters of that time because of inadequate controls of the genetic stock, the operations, and the symptoms displayed. William James (**15**) did psychology an invaluable service in subjecting this experiment to thoughtful scrutiny in his "Principles of Psychology" (1890), and in that connection reviewing a great deal of morphological and behavioral data previously offered in support of the inheritance of acquired characters. To his credit, be it said, he found it totally unconvincing.

Within recent years the most sincere and persistent attempt to cause a learned response to attain hereditary status was that of McDougall (**19**). Unfortunately, the results have been most difficult to interpret, both for him and for others, due, in part, to the fact that complete records regarding the animals discarded as well as those experimented upon were not preserved for retrospective consideration. With some reservations, however, McDougall interpreted his results as favoring the Lamarckian hypothesis; others, competent to review them, have preferred to suspend judgment or to presume that reductions in learning rate such as he has obtained would most likely arise from unintentional selective breeding. Whatever the final interpretation of these studies may be, we may say now that in the final stages of the experiments it was apparent to McDougall and to others that nothing even closely

resembling an "acquired" instinct was being set up. McDougall was unable to contrive a method of forcing the acquired responses into the germ plasm.

In view of the foregoing and still other lines of negative evidence, should we say, or hope, that the inheritance of learned responses as a source of hereditary variations is a dead issue? Neither would be justified. To a degree unequaled by any other postulate so far advanced, this conception superficially accounts for the small and the great steps in the evolution of diversity in a manner that is satisfying both to personal experience and to imagination. While this condition obtains, there will be able experimenters seeking new ways of making tenable what hitherto has been an unverified postulate.

2. Hereditary variations. Hereditary variations of the true and the "acquired" instincts, occurring in every direction, were considered the fundamental sources from which selecting and isolating agencies might create noteworthy diversity. Neither in 1842 nor in later years did Darwin assign much weight to gross variations as exemplified by "sports," except possibly when these were cultivated by man under artificial conditions. Telling against their importance was their rarity, and for that reason the small chance they would have in making their influence felt in competition with other animals already standardized for conditions then existing; also, among animals, as opposed to plants, the vast majority of "sports" described in the literature were monstrosities which because of organic weakness only rarely survived and begot offspring. Of course there were exceptions. The erratic flight of the tumbler pigeon might be considered an example of a "sport" that has been able to perpetuate its kind under conditions of domestication and selective breeding by pigeon fanciers, but which under natural conditions probably would never have become established as a variety or race. So also the pointing by bird dogs might be looked upon as a "sport" since this tendency was known to crop out now and then among various breeds without tuition; quite probably it had been preserved by dog fanciers through isolation and selective mating of individuals in which this novel response had appeared.

Since unequivocal examples of "sports" perpetuating themselves in the feral state were rare, there seemed to be no logical ground for questioning the wisdom of placing the chief burden on small variations. Moreover, this step was consistent with a basic tenet of Darwin's theory of descent which envisaged the abruptness

of transitions between behavioral series relating to any fundamental instinct, such as nesting in reptiles, birds, and rodents, as the result of sporadic extinction of intermediates from a long line of ancestral stocks,—these exhibiting continuous variations and extending from remote antiquity to the present day.

A growing interest in discontinuous variation was apparent toward the end of the nineteenth century, owing largely to de Vries' extensive work on mutant plants that were normal in development, fertile *inter se*, and infertile or less fertile when crossed with ancestral or unrelated stock. Here in one generation was notable diversity and with it an isolating mechanism by which the swamping effects of hybridization might be minimized or obviated while the new type was becoming established. This work led de Vries to discard Darwin's theory of pangenesis and to question his belief that continuous variations provided the major sources for diversification. In this he was materially supported by Bateson and other geneticists of that period. Their work, together with numerous advances in knowledge of cell structure, particularly the chromosomal constituents of the nuclei, and the significance of meiosis, knowledge which for the most part had gradually accumulated for approximately 25 years, laid a foundation for immediate appreciation of Mendel's paper of 1866, the main tenets of which were independently confirmed by de Vries, Correns, and Tschermak in 1900.

In 1902 Darbishire (3) demonstrated that the Mendelian principles could be applied to behavioral characters of the Japanese waltzing mouse. Experimental studies by a number of competent observers had indicated that this type of locomotion is not acquired by imitation or learned through tuition or practice. It appears late in the nursing period and, although subject to minor variations due to environmental influences, is not unlike other stable patterns of instinctive behavior. Darbishire crossed pure-line waltzers with pure-line European albinos that were free from the whirling tendency. All of the F_1 generation, the number running into the hundreds, were free from the waltzing behavior. The F_1 hybrids when crossed *inter se* gave ratios of 4 normal to 1 waltzer, instead of the expected number if one assumes that waltzing is a recessive unit character. Subsequent experiments by other workers make the latter assumption tenable and yield the expected ratios. Needless to say, Darbishire's demonstration that an unlearned behavioral pattern is transmitted in breeding tests, somewhat as morphological characters are, tended to stimulate new lines of research

on the heredity of instinctive dispositions. Among the most striking of these were studies on laying hens.

The first egg-laying contest of national scope was held in England in 1897. Prior to that time practical poultry breeders had selected birds which matured early, laid eggs in the "off season," and did not interrupt the laying sequence with periods of broodiness. Although pure lines had not been developed in all of these traits, considerable progress in that direction had been made with respect to broodiness and early maturity,—sufficient at least to suggest the following tests. Hurst, in 1903, crossed pure-line Cochins with pure-line Black Hamburghs (**14**). All of the hens of the F_1 generation were good "sitters," broodiness usually appearing after the hens had laid about a dozen eggs. In this respect they resembled the Cochin but not the Hamburgh strain. The F_2 generation segregated so as to give a ratio of 3 broody hens to 1 non-broody hen. Further tests support the assumption that broodiness is transmitted as a dominant unit character and non-broodiness as a recessive unit character. Table I gives additional data showing the outcome of crossing several genetic types of males and females derived from White Leghorn and White Wyandotte races. Incomplete dominance, or possibly impurity of the original strains, may account for the ratios deviating somewhat more from the calculated ratios than would be expected. Excesses of non-broody hens sometimes result from the fact than an occasional broody-type does not display the broody behavior until the second year; correction for these cases harmonizes the empirical and the calculated ratios.

Before discussing the onset of laying in domestic hens, geneticists must make certain arbitrary distinctions as to what constitutes early and late layers. Provisionally, those beginning to lay between the ages of 4 and 8 months are designated as early, and those beginning between the ages of 9 and 13 months as late layers (**14**). Now if homozygous "earlies" are crossed with homozygous "lates" the F_1 generation tends to fall, with but few exceptions, into the category of "earlies." When the F_1 males and females are interbred their F_2 females approximate the ratio of 3 "earlies" to 1 "late." The results from back crosses and other experimental matings support the hypothesis that early maturity behaves as a dominant, and late maturity as a recessive unit character. Table II gives results from crossing animals whose gamete formulae are conjectured by controlled matings of the an-

TABLE I

BROODINESS (H FACTOR)

Daughters sired by White Leghorns and White Wyandottes
H = broody; h = non-broody From Hurst (**14**, p. 492)

Matings				*Offspring*	*B. Grades (times Broody first season)*							*Observed*		*Calculated*		
Sires		*Dams*		*Daughters*	*Broody*						*Non-Broody*					
Nos.	*Factors*	*Nos.*	*Factors*	*Nos.*	*6*	*5*	*4*	*3*	*2*	*1*	*0*	*Broody*	*Non-Broody*	*Broody*	*Non-Broody*	
1	hh	2	HH	6	—	—	1	1	1	3	—	6	0	6.00	0.00	A
1	Hh	2	Hh	10	—	—	1	1	4	—	4	6	4	7.50	2.50	B
2	Hh	3	hh	40	2	1	—	3	6	4	24	16	24	20.00	20.00	C
6	hh	18	Hh	50	—	—	1	6	5	5	33	17	33	25.00	25.00	C
13	hh	41	hh	95	—	—	—	2	2	1	90	5	90	0.00	95.00	D
23	—	66	—	201	2	1	3	13	18	13	151	50	151	58.50	142.50	

Mendelian expectation: A—all Broody; B—3 Broody, 1 Non-broody; C—1 Broody, 1 Non-broody; D—all Non-Broody.

TABLE II

SEXUAL MATURITY (AGE AT FIRST EGG; E FACTOR)
Daughters sired by White Leghorns and White Wyandottes
E=early; e=late From Hurst (**14**, p. 477)

Matings				*Offspring*	*S.M. Grades (months of 30 days)*										*Observed*		*Calculated*		
Sires		*Dams*		*Daughters*	*Early*					*Late*									
Nos.	*Factors*	*Nos.*	*Factors*	*Nos.*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*Early*	*Late*	*Early*	*Late*	
9	EE	11	EE	61	1	12	23	20	5	—	—	—	—	—	61	0	61.00	0.00	A
9	EE	35	Ee	104	—	3	39	35	24	3	—	—	—	—	101	3	104.00	0.00	
2	Ee	3	EE	18	—	3	7	8	—	—	—	—	—	—	18	0	18.00	0.00	
3	EE	3	ee	23	—	—	4	11	8	—	—	—	—	—	23	0	23.00	0.00	
6	Ee	21	Ee	82	—	—	16	19	25	13	5	3	1	—	60	22	61.50	20.50	B
1	Ee	7	ee	28	—	—	1	7	5	6	9	—	—	—	13	15	14.00	14.00	C
2	ee	4	Ee	15	—	—	—	2	7	3	3	—	—	—	9	6	7.50	7.50	
1	ee	1	ee	4	—	—	—	—	1	1	1	—	—	1	1	3	0.00	4.00	D
33	—	85	—	335	1	18	90	102	75	26	18	3	1	1	286	49	289.00	46.00	

Mendelian expectations: A—all Early; B—3 Early, 1 Late; C—1 Early, 1 Late; D—all Late.

cestral stock. The empirical data conform rather closely to the calculated data. Onset of egg-laying, a sex-limited activity, is closely related to age of first estrus in domestic fowls. Although one cannot definitely say that early and late behavioral sexual maturity will behave as onset of egg-laying in genetic tests, there is analagous evidence that I shall not discuss which clearly indicates that this would be the result.

Still other applications of the Mendelian method of studying variation and inheritance of instinctive reactions might be given. The number of cases, however, is extremely small as compared with that in which somatic characters have been studied. This is due in part to rarity of inter-specific fertility between species that have distinctive homologous instincts. It is due also to the decided preference geneticists have shown for structural, as contrasted with functional, characters. Animal psycholgists, for some unknown reason, have not had even sufficient interest in the topic to keep the growing literature assembled, to say nothing of preparing themselves for creditable research in the field. Fortunately, a few biologists are again developing interests in this subject and are taking the necessary steps to determine within what limits the laws of variation derived from studies of the transmission of structures may be applied to representative instinctive and other behavioral characters.

3. *Instigation and Realization:* In 1842 Darwin had only tentative suggestions relating to the initiation of hereditary variations. Without thoroughly weighing the matter he stated that significant diversity could arise from the interbreeding of races in which behavioral homologues were noticeably different, e.g., wildness, timidity, or ferocity. In developing this point he said, in 1844,

> When once two or more races are formed, or if more than one race, or species fertile *inter se*, originally existed in a wild state, their crossing becomes a most copious source of new races. When two well-marked races are crossed the offspring in the first generation take more or less after either parent or are quite intermediate between them, or rarely assume characters in some degree new. In the second and several succeeding generations, the offspring are generally found to vary exceedingly, one compared with another, and many revert to their ancestral forms. This greater variability in succeeding generations seems analogous to the breaking or variability of organic beings after having been bred for some generations under domestication (**7**, p. 68).

In the "Origin" he de-emphasized the importance of crossing of races or species as a means of initiating variations which, having

adaptive value, might be the initial step in diversification. The change in viewpoint expressed in 1859 probably resulted from his experiences in pigeon breeding wherein he observed the rapidity with which a mongrel race develops when indiscriminate matings are permitted between two initially different races, as most probably would obtain in nature. In the main his final viewpoint was not unlike that expressed by scientists of our day. Hybridization ordinarily adds nothing, except possibly in rare instances in which it accelerates the rate of mutation (**8**). It chiefly reveals.

In keeping with beliefs commonly held in 1842 Darwin stated that various agents might act directly upon the germ cells so as to instigate hereditary variations. The most important of these were diet, climate, toxic and infectious agents, and sudden changes in living conditions. For many years he spoke of the profuseness of variation occurring in domesticated animals and especially the sudden changes produced by bringing them from the wild state to an artificial habitat. He believed that these agencies somehow caused the reproductive organs to fail "in their ordinary functions of producing new organic beings closely like their parents." Today we speak of two, and only two, processes initiating hereditary variation: namely, gene mutation and chromosomal changes. To these are accredited all initial variation, whether small or large, continuous or discrete. The agencies mentioned by Darwin have significance only if they effect mutations of genes or produce chromosomal changes. So far the vast majority of these initial changes have occurred spontaneously, i.e., from causes largely unknown. Recently a few noteworthy somatic mutations have been caused by irradiation of the germinal cells.

In making the foregoing summary statements I have omitted essential landmarks in the unfolding of discoveries relating to initiation of variations; to some of these we now return.

a. Sex determination: Between 1875 and 1900 the main points relating to *maturation* of the germ cells and the union of nuclei from ovum and sperm had been revealed; yet no one as yet had a clue to the solution of the age-old problem of sex determination. MacClung in 1902 found an accessory chromosome in insects which he related to sex determination (**18**). In 1907 Correns postulated two kinds of male gametes, one determining the male and the other determining the female (**2**). In one well-known type of sex determination (XY), found in *Drosophila* and most of the mammals so far studied, the males have a pair of unlike sex chromo-

somes (XY) and the females a pair of like-sex chromosomes (XX). In another type (WZ), common in birds, the female has the pair of unlike sex chromosomes and the male the like pair. Among the *Hymenoptera* (bees, wasps, ants), a few of the *Homoptera* (white flies, scale insects), and a few other species of insects a still different type of sex determination is found. The males have only half as many chromosomes (haploid) as the females (diploid). For example, the drone of the honey bee has 16 whereas the workers and the queens have 32 chromosomes. This results from the fact that the queen does not release sperm upon all of the eggs as they are laid. Those not fertilized develop parthenogenetically into males and have only the chromosomes of the unfertilized egg; the fertilized eggs develop into females in which the chromosomes of both sperm and egg are summated.

To say that different genes residing only in the sex chromosomes have full responsibility for the initiation of development which eventuates in diverse primary and secondary sexual behavior between the sexes within a species and between them in closely and distantly related species would be incorrect. Yet it is quite in keeping with the available evidence to credit them with primary leadership in the instigation of this process. This is a first step in accounting for ontogenesis of one large group of instinctive responses. How far it may be extended in explaining phylogenesis of the same remains to be determined.

b. Sex differentiation: What control genes may exercise beyond the initial differentiation is largely conjectural at the present time. It is known, however, that the differentiation of primary and secondary sexual instincts in vertebrates is always preceded by the appearance of chemical substances from the endocrine glands. These are operative in developmental processes that produce the adult sexual activities, such as unlearned vocalizations and postural lures that attract males and females to each other during the "mating" season; fighting by males for exclusive control of females during certain phases of the reproductive cycle; copulation; serial acts having to do with laying and incubating eggs or with parturition; nidification; hiding, feeding, and defending of offspring, and age of onset, periodicity, and time of waning of many of these instinctive activities. From the fact that quite diverse behavior patterns are produced by the same substances in different races or species it is inferred that there is some degree of genic regulation of both production and utilization of the endocrine substances.

In the honey bee still different extrinsic factors contribute to differentiation during the developmental period. The workers and queens are alike as to their chromosomal make-up. A female embryo may become a worker or a queen. Which way it develops depends on how it is reared. Those becoming workers are kept in small cells and fed upon pollen from the third day of embryonal life; those becoming queens are reared in large cells and fed on royal jelly throughout the embryonal period. While we await the time when experimental embryologists can delineate the precise manner in which the extrinsic factors affect differentiation, we have the satisfaction of knowing that diversification is limited to a short period of embryonal and early adult life. Moreover, the problem to be solved falls in with those of morphogenesis for which a few promising methods of attack are now available. Again we must remind ourselves, however, that we are concerned here with ontogenesis rather than phylogenesis and that there is no guarantee that elucidation of the first will clarify the second.

c. Autosomal instincts: Although our data on autosomal inheritance of unlearned behavior are less abundant and exact than those relating to sex, they indicate that gene complexes serve as instigators and regulators of variation. The whirling tendency in mice is a recessive Mendelian character based on developmental defects of the inner ear. It is not associated with any lethal factor and is neither sex-linked nor linked with the factors for agouti, albinism, pink-eye, dilution, brown, Dutch spotting, short-ear, or kinky-tail (10). Pacing as a mode of locomotion arises spontaneously as a mutation in dogs, horses, and other quadrupeds. When pure-line trotting and pacing horses are hybridized, it behaves as a recessive unit character. It is now apparent that the basis of wildness and savageness in rats is inherited in gene-controlled patterns. According to Keeler (16) most of the tame strains of albinos employed in American laboratories bear the black gene or the black and piebald genes combined, the coat-color effects of which are masked by the albino gene. These tame strains appeared in our time as mutants from the wild Norway stock. Some of the hunting responses of dogs are transmitted as hereditary characters although the relationships are still somewhat obscure. Fighting and non-fighting mice have been subjected to extensive genetic analyses with results that leave no doubt as to their being transmitted as hereditary characters, despite the fact that they are easily masked by experience.

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When appropriate methods of selection and isolation are applied to the foregoing hereditary variations, and still others not mentioned, many kinds and degrees of diversity may be produced.

Selection: Natural and Sexual

Without selection, variation would count for nothing in the production of notable diversity in instinctive activities. Conversely, selection is impotent without hereditary variations on which to work. These ideas had become apparent to Darwin following his voyage on the Beagle. Upon his return he began to assemble evidence, from all available sources, to support a plausible account of the selective mechanisms in nature whereby notable diversity could have developed as a necessary consequence of the struggle for survival through successive additions of behavioral adaptations.

He assumed that *Nature* selects animals in the feral state as practical breeders or fanciers choose those under domestication, but always without transcendental guidance or orthodirectional plan. From variations continually occurring in every direction (as a result of mutations and chromosomal changes, one now adds) nature selects those which *fortuitously* have adaptive value to their possessors which gives them an advantage over those not possessing equivalent variations. Sexual selection is only a special type of natural selection. Insofar as it pertains to instinctive behavior, it purports to account for only one or two classes of aggressive instincts and a few classes of preferential responses pertaining to mateships.

To what extent natural selection can account for the original hereditary adaptive behavior is still controversial. The question cannot be settled one way or the other by weight of the evidence now available. We know that in the case of dichotomies like pacing and trotting or whirling and non-whirling little more is accomplished after pure lines have been established, beyond strengthening the vigor or frequency of manifestation. In onset of puberty in hens, mice, rats, swine, and many other animals notable reductions have been made, although practical limits are finally reached because somatic maturity can no longer be coordinated with behavioral maturity. Also, selection has eradicated broodiness in certain races of domestic hens, a gain which, when coupled with early maturity and winter laying, has enormous economic worth to the poultry industry. Furthermore, relatively tame races of rats have been developed side by side with parent stock which is no

tamer than that living in the wild state. Mutations among rats at the Wistar Institute clearly suggest a plausible explanation of the "wild dogs" of Cuba which, as an obsession, overrun the books of Darwin. Even relevant statements can be made on the transmission of hereditary characters among the "neuter" insects, troublesome cases for Darwin and his followers. Yet despite considerable thought and planning to this end no evolutionist or practical breeder has ever contrived a simple scheme for intruding upon the "mating" flight of the honey bee, *Apis mellifica*, with a view to eliminating it entirely. The bee industry could well afford to offer a million dollars to the man who first produces a colony of honey bees that will mate in the laboratory as do the geneticists' special, *Drosophila melanogaster*.

Isolating Mechanisms

The necessity of isolation in early stages of diversification was perceived by all of the early evolutionists, but it was not well developed as a topic in evolutionary theory before the time of Lamarck and Charles Darwin. Isolation became a controversial topic during the second half of the nineteenth century but finally the consensus of opinion as to its importance stabilized at a point not essentially different from that expressed by Darwin in 1859. It is now apparent that isolating devices were no less instrumental in affording conditions for diversification of instincts than of somatic characters.

Among fundamental researches devoted to isolation are those dealing with psychological incompatibilities which prevent or minimize the crossing of races or interfertile species, thereby masking or eradicating small gains in diversification. Instincts which are presumed to be the product of isolation in turn become most effective isolating mechanisms themselves. Instances are numerous and, time permitting, would be most interesting to consider.

As a final word, and without pausing to summarize the points I have elected to stress in this brief survey of a century of progress, may I express extreme gratitude to the well-nigh innumerable biologists who, unmindful of "academic" criticisms of instinct, have continued to undertake fundamental research on the topic. Questions of origin and evolution have given them a common theme, a harmonizing principle for diverse undertakings. Biologists are now laying foundations for unparalleled expansion in a

hitherto unemphasized phase of animal psychology, one that is not revolutionary but highly useful: namely, the field of

Behavioral Ecology

Animal psychologists have neglected the study and appraisal of this important topic. Therefore, I can think of no better attitude with which to indoctrinate our colleagues of tomorrow who would make animal psychology their specialty than one of constant vigilance for opportunities to study the instincts as they are related to the subject of behavioral ecology.

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SEASON OF BIRTH AND MENTAL DIFFERENCES

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Whether the season of birth has any influence physically or mentally upon the individual is a question that has been raised by many research workers. The physical differences between children born in different seasons have been studied by numerous workers and most of these studies up to 1934 have been admirably described and summarized by Sanders (**19**). Weight at birth is the measure most frequently reported and, after a careful scrutiny of the data presented by about 20 studies, Sanders concludes that there is some increase in birth size of children born in late summer and fall, but that it can hardly be considered significant. It is not the purpose of this review, however, to duplicate the work of Sanders or to attempt a complete presentation of later reports on physical factors, but rather to refer to such only to the extent that they may throw some light upon mental differences related to season of birth.

Blonsky (**1**) in 1929 seems to have been the first to use results from mental tests. With only 453 cases of backward children he noted the fact that the highest mean IQ occurred in spring. The difference between the means for spring and the other seasons was not great, but he seemed to feel that he had obtained a finding of some eugenic significance. Very skeptical of such a result, Pintner (**13**) gathered 4925 cases and found differences in mean IQ between the seasons that approached statistical reliability. He emphasized the relatively low IQ occurring in winter. Also, and independently, stimulated by Blonsky's report, Looft (**10**) in Norway published results on feebleminded and backward cases.

Summary of Results

From these beginnings there have sprung about a dozen different reports dealing with this general problem, culminating recently in the monograph by Fitt (**4**). Table I gives a summary of eleven of these studies in chronological order. It will be noted that the studies vary greatly in the number of cases used, from only 337 by Looft to about 22,000 by Fitt. In most cases children have been used, but there are two reports for college students and one report for adult men. The present reviewers have arranged the lowest and the highest means by seasons in the last four col-

TABLE I

SUMMARY OF STUDIES USING INTELLIGENCE TESTS

Author	*Date*	*Cases*	*Lowest*		*Highest*	
			Season	*Mean Intelligence*	*Season*	*Mean Intelligence*
Blonsky (1)	1929	453 backward children	Autumn	81.3	Spring	84.3
			Winter	81.3		
Pintner (13)	1931	4,925 school children	Winter	95.9	Spring	97.2
					Summer	97.2
Pintner & Forlano (15)	1933	17,502 school children	Winter	100.65	Spring	102.3
Looft (10)	1934	337 (IQ's 85 to 100)	Summer	90.3	Spring	91.3
					Autumn	91.3
Pintner & Maller (17)	1937	6,353 school children	Winter	94.5	Autumn	96.5
Fialkin & Beckman (3)	1938	3,189 adult men	Winter	6.53*	Spring	6.69*
Pintner & Forlano (16)	1939	2,907 children in southern hemisphere	Winter	101.5	Spring	102.8
			Autumn	101.5		
		8,985 low IQ's	Winter	64.96	Spring	65.5
		658 institutional f.m.	Winter	52.2	Spring	53.2
MacMeeken (11)	1939	874 school children	Spring	99.4	Summer	101.2
Held (8)	1940	2,327 university students	Winter	49.3†	Summer	50.4†
Forlano & Ehrlich (5)	1941	7,897 college students	Autumn	211.8**	Spring	214.3**
			Winter	211.8**		
Fitt (4)	1941	22,356 children ages 10, 11, 12	Autumn	100.77	Summer	102.27

* Sigma units.
† Percentile.
** Score.

umns. In all cases these means refer to IQ's unless otherwise specified; *e.g.*, the results for the college students and adult men are not in terms of IQ. All of the data are from the northern hemisphere, except those of Fitt which were obtained in New Zealand, and some of the Pintner and Forlano data which came from the southern hemisphere. Of the data in the northern hemisphere, Russia, Norway and Scotland are represented, but the bulk of the results comes from the United States.

The year is divided into four seasons, but there is no definite universal convention as to when each season begins. Perhaps the most common custom is to regard spring as including March, April and May; summer is June, July and August; and so on. This division is indicated in both British and American dictionaries. But the dictionaries also refer to the equinoxes and solstices as marking the beginnings of the various seasons, so that spring would begin about the twenty-first of March and the predominantly spring months would be April, May and June; summer would include July, August and September; and so on. Some of our investigators have used these divisions in their studies. To make matters still more complicated, Fitt uses still another dividing line for the seasons. According to Fitt, the month in which the equinox, or solstice, occurs marks the middle month of each season, so that spring includes February, March and April; summer includes May, June and July; and so on. Fitt uses these "seasons" because they coincide with the varying amounts of solar light shed upon the earth; *i.e.* the most during summer (May, June, July) and the least during winter (November, December, January). Fitt reports all his results in terms of months of conception in order to conform to his hypothesis, which will be discussed later. In Table I, however, the present writers have transformed his results into birth months and have adopted the common custom in regard to the seasons. All data from the southern hemisphere have been translated into the equivalent months or seasons for the northern hemisphere.

With regard to the number of cases given by Fitt, it should be stated that 22,356 is the total number tested by him and includes four age groups, namely ages 10, 11, 12, 13. In Table I the results for the three most adequately sampled ages, namely 10, 11, 12, are given. It is not possible from the data presented by Fitt to tell exactly how many cases are actually involved, but presumably these three ages account for more than three-quarters of the cases;

i.e. probably between 18 and 20 thousand. We have, however, calculated the mean IQ per season for all the 22,356 and obtain the same highest and lowest seasonal means. Autumn is lowest with a mean of 100.3 and summer highest with a mean of 100.63. The difference between these two means is therefore less than that which appears in Table I.

A comment must be made on the MacMeeken report (11). The 874 cases consist of four roughly equal samples of children born on the first of February, first of May, first of August and first of November. Spring and summer in our table, therefore, refer to May and August births, and not to cases spread over the whole season. Rusk (18) reports briefly on this Scottish survey described in detail by Macmeeken. He gives the mean IQ for the February cases as 96.6, whereas Macmeeken reports this as 99.6. We have assumed that the Rusk figure is a typographical error. If it is not it would change the season in the table from spring to winter and fall more in line with the rest of the data.

Looking now at the two columns showing the seasons of lowest and highest means, we note that winter is predominant in the one and spring and summer in the other. For the lowest seasonal mean, winter occurs 10 times, autumn 4 times, spring and summer once each. The low summer mean is associated with a study of only 337 cases, the lowest number of cases reported by any of the workers mentioned. The low spring mean occurs in the Scottish study, where the number of cases was not very large, but they were carefully chosen, because they included all children born on a given day in a given year. Apart from these two discrepancies, winter and autumn, the cold and dark months of the year, predominate in showing the lowest means.

With regard to the seasons showing the highest means the general picture is equally clear. Spring occurs 9 times, summer 4 times, autumn only twice and winter not at all. One of the autumn occurrences comes again from the report having the fewest number of cases, but the other comes from a careful report with a considerable number of cases.

Fitt (4) gives the average IQ's for each month from four studies. Using his table (Table 36) and computing averages for the conventional seasons, one obtains the lowest IQ for winter, 98.03; then spring, 98.80; then autumn, 99.23; and the highest for summer, 99.47.

There seems, therefore, to emerge from all these studies a

strong suggestion of a slightly lower mean intelligence among individuals born in the winter-autumn half of the year, the colder-darker months, as compared with a slightly higher mean intelligence for individuals born in the spring-summer half of the year, the warmer-lighter months. This difference is very slight and in many cases where the author has reported the statistical significance of his data, it is well below the conventional limits, but in some cases it is also well above. However, whether the differences are statistically significant or not, the general picture presented by the data of Table I clearly indicates some universal trend. It is not a picture such as mere chance differences in seasonal IQ would present. These results come from many different investigators in many different countries and include individuals of very divergent ages.

A brief report by Chenoweth and Canning (2) shows a curve of the psychological scores of 489 students by month of birth. As they give no table of actual monthly means, their data could not be incorporated in our table. From the curve it would seem as if the lowest mean scores occur for the summer months and the highest scores for December through April. These findings are directly contrary to the general findings so far reported, but the number of cases is very small, no actual figures are given, and it is difficult to tell how the curves were constructed.

Another article by Mills (12) dealing with both physical and mental development as influenced by season uses college matriculation as an index of mental development and thus does not lend itself to inclusion in our table. Mills believes that the differences are due to the season when conception takes place. "Winter conception," he writes, "provides a significant advantage along lines of mental achievement," due to the "higher metabolic level of parental protoplasmic vigor" at that season of the year. His data consist of information regarding 45,000 college freshmen in various colleges. Calculating the deviations from normal expectancy of matriculation according to conception month, he finds the highest expectancy to occur in the autumn-winter season and the lowest in the spring-summer season. Turning his conception months into birth months, we note that the lowest expectancy occurs in the winter season, and therefore in so far as college matriculation is an index of mental development, we find that Mills' results agree roughtly with the general findings of intelligence tests.

Only one study, that of Forlano and Ehrlich (5), has gone be-

yond standard intelligence tests to include the results from objective personality tests. The tests used gave a measure of introversion-extraversion and a measure of feelings of inadequacy. Persons born in autumn and winter seemed to be more extraverted, while those in spring and summer were slightly more introverted. Those born in the summer also showed more feelings of inferiority. These are merely suggestions of possible trends, and the authors of the study warn against drawing any conclusions until more data are at hand.

Suggested Explanations

Many of the authors make certain hypotheses to explain these seasonal trends. Some do not. They merely present their data, calculate the statistical significance of the differences, and, finding this to be very low, dismiss the matter as due to chance. The hypotheses may be divided into two types, exogenous and endogenous. The exogenous theories seek to find some explanation in such physical factors as temperature, sunshine, etc., or in the health or vitality of the mother or child, or in the differential birth rate of different groups of people at different seasons of the year. The endogenous theories seek an explanation in seasonal changes within the organism more or less independent of external conditions.

Exogenous Theories

Blonsky (1) mentions the importance of sunlight, among other factors, for the health of the child during the first few months of life. Looft (10) also points out the importance of sunlight and mentions the relation between rachitic diseases and sunlight. Pintner and Forlano (15) present curves showing the correspondence between monthly changes in temperature and amount of sunshine and monthly differences in IQ. They also report a rank correlation of +.59 between mean monthly IQ and amount of sunshine, and a rank correlation of +.67 between monthly IQ and mean monthly temperature.

The general health or vitality of the individual is likely to be better in summer than in winter. The winter-born children are weaned in summer, says Blonsky (1), and this presents peculiar dangers for them. Pintner and Maller (17) and Pintner and Forlano (15) present data to show the higher mortality rates in winter for people in general, for infants during the first year of life and for infants during the first month of life (neo-natal mortality). Pintner and Forlano (15) comment on the generally accepted be-

lief in the higher morbidity rates for the winter months, and from these findings with reference to mortality and morbidity present a tentative hypothesis. They say, "Children born in winter who survive are more likely to be impaired. Children born in winter suffer more illness and are born of mothers weighted with more illness." Fitt argues against this hypothesis, pointing out that the higher mortality rates for children born in winter would probably eliminate relatively more lower IQ's and therefore the mean IQ for the winter months should increase rather than decrease. He does not, however, take into account the factor of greater morbidity during the winter months among those who survive.

The importance of the age at beginning school is mentioned by Blonsky, who says that the spring-born children have the advantage here in that they are a month or so older in beginning school. The argument here is not clear. No other worker has published any evidence in this connection, although probably many have thought of it. In all probability it would be difficult to find any relationship between month of birth and age at beginning school, particularly so in many areas where great latitude as to age at beginning school exists and also where children may begin their schooling in September or in February. Furthermore is it advantageous to begin school a little older as Blonsky suggests, or a little younger? And lastly, such trivial differences would hardly have influences stretching into adolescence and adulthood.

Seasonal differences in birth rates of three different ethnic groups; namely, Italian, Jewish and Negro, have been studied by Pintner and Maller (17). Although they found some seasonal differences in birth rates, they also found the curves for average monthly IQ's to be similar for all three groups. Goodenough (6, 7) believes that the seasonal fluctuations in IQ can be explained by the selective planning of births by the more intelligent parents. Dividing her cases into six occupational levels, she finds in the three highest levels more births occurring in spring and summer, whereas in the three lowest levels the number of births is distributed among the four seasons in accordance with chance expectancy. If this conscious selective planning of births to occur at a favorable season of the year is actually taking place in this country as Goodenough believes, then it would seem that American mothers had anticipated Blonsky's advice to Soviet mothers to see to it that their children should be born in the most favorable season of the year. In addition to her own data, Goodenough also uses the Pintner

and Forlano data (**15**) to show that in their highest social level the fewest number of births occurred in winter, whereas in the medium and low social levels no such differentiation was apparent. When all three levels are combined, the lowest mean IQ occurs in winter, but this cannot be due to selective planning in the highest social level, because the lowest mean IQ occurs in winter at each social level taken separately. The lowest mean IQ occurs in winter in the lowest social level, where selective planning of births has been ruled out by the hypothesis and by the number of births per season.

Endogenous Theories

Two writers, presumably independently of each other, have proposed endogenous theories somewhat similar in nature. Huntington (**9**) in this country described his theory at great length in a book published in 1938. Fitt (**4**) in New Zealand published his theory in 1941. He makes no reference to the Huntington book and presumably had no access to it at the time he was writing. As we have noted above, Mills (**12**) also believes seasonal differences are caused by endogenous factors at the time of conception.

Huntington believes there is a basic animal rhythm causing the greater number of births to occur in early spring (February, March, April). "Births of persons of unusual genius," he says, "conform to the animal rhythm and to the temperature much more closely than do births in general." He presents many curves of the birth months of eminent individuals and concludes, "the facts thus far before us suggest that persons of unusual mental ability show a stronger tendency than others to be born in winter."

This conclusion of Huntington does not agree with the study by Pintner and Forlano (**14**) of the birth month of eminent men. The criterion of eminence used was inclusion in *Who's Who in America* or *American Men of Science* or Plarr's *Men and Women of the Time.* Pintner and Forlano conclude, "Our data do not show any reliable differences between months or seasons with reference to the birthdays of eminent men. There is little consistency in the trend from sample to sample. The highest percentage may fall in any season or any month." Furthermore, Huntington's conclusion does not fit into the general findings with reference to IQ and season of birth. The most stable finding of the many studies we have already reviewed is the fact of the slightly lower IQ of individuals born in the winter months. We realize of course that high IQ and eminence are

not the same thing, although one would expect a high correlation between the two. Huntington's theory of a basic animal rhythm responsible for an optimum season of birth is not invalidated by the findings we have mentioned. The theory may still be tenable, but he may not have chosen the correct optimum season. The data from intelligence tests would suggest that the optimum season may be summer or spring and the worst season winter.

Somewhat similar to Huntington's theory is the one recently propounded by Fitt (**4**). He also suggests that there is an internal seasonal biological rhythm. It may be an endocrine rhythm. It is analogous to the process of hibernation occurring in many animal species. This means for the human organism that the autumn-winter period is the period of minimal stress, and the spring-summer half of the year the period of maximum stress. Therefore, argues Fitt, the best period for conception is the period of minimal stress; *i.e.*, the autumn-winter period. We may note here the similarity of this theory to the "higher metabolic level" during winter as suggested by Mills (**12**). Fitt uses the month in which the equinox or solstice occurs as the mid-month of each season, hence his autumn-winter period of minimal stress is from August to January inclusive. Conceptions during these months would result in births during May to October, and in general this is the period showing the highest mean IQ. The spring-summer period of maximum stress would extend from February to July inclusive and conceptions during these months would result in births during November to April. This period of the year coincides roughly with the winter season where most investigators find the lowest mean IQ.

Fitt's hypothesis of an internal biological rhythm seems to fit the data from intelligence tests much better than Huntington's theory of the basic animal rhythm. In support of his hypothesis, Fitt also presents data from learning tests, seasonal fluctuations in increases in height and weight, and seasonal trends in mortality, morbidity, delinquency, and so forth. A discussion of these factors would take us far beyond the scope of the present review. It is, however, appropriate to mention that Fitt is the first writer in this field who has suggested possible practical educational implications that might follow from all this work on the basis of his hypothesis. Since the autumn-winter period (August to January) is the period of minimal biological stress, it is, he argues, the best period for mental work. We should, therefore, adjust our educational year so

that it ends with its final examinations in December or January, that is, ending with the period when the organism is at its optimum for mental work. The shift to new classes and new courses would begin in January or February. The usual summer vacation in the middle of this readjusted academic year would be an advantage in that it would be a pause for recuperation before the final half of the academic year, that is the period of optimum mental work. These practical applications are ingenious and suggestive, but it seems to the present writers that the hypothesis of a basic biological rhythm will have to be far more firmly established before it would be wise to attempt to carry them into effect. However, it remains to Fitt's credit that he has attempted to bring the data with reference to IQ and season of birth into line with the findings as to seasonal fluctuations in many other fields, and his hypothesis will have to be reckoned with in all future work.

Conclusion

In this review we have traced the studies relating to intelligence and season of birth from their beginning in 1929 to the present day. The problem seemed at first ridiculous and inconsequential. As study after study appeared, the fact of differential seasonal trends became more apparent, the subjects studied became more numerous and included older people as well as school children, the authors sought in various directions for possible reasons until finally we have arrived at attempts to envisage these seasonal trends in IQ as merely one aspect of the seasonal fluctuations of numerous physical, mental and sociological factors. Future work will be directed to more complete samples of whole age groups tested by means of all kinds of psychological tests, not merely intelligence tests, and a more rigorous checking of the various exogenous and endogenous hypotheses that have been proposed.

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PSYCHOLOGY AND THE WAR

Edited by

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TRAINING IN MILITARY PERSONNEL PSYCHOLOGY: MINIMUM REQUIREMENTS FOR COLLEGE COURSES

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I

During the next year many future Army officers will take training in personnel work in university departments of psychology throughout the country. Familiarity with assets and liabilities of workers now performing technical and consultant duties of personnel officers, both in uniform and in civilian professional status, suggests that it is desirable for these departments of psychology to consider several requirements for training military personnel psychologists.

Suggested minimum essentials for college military personnel training programs are submitted here chiefly for the guidance of heads of departments and others who will plan the courses. It is hoped that civilian instructors who develop and present the courses will profit from the military orientation and the source materials that are presented on the following pages, and that the eventual military value of students who take such courses will be increased.

The necessity for training military psychologists has been treated in an article by Pennington and Chase (8), who support their statement by reference to four previous publications in which this need has been emphasized. Their suggested course in military psychology does not, however, stress needed specific academic courses in military personnel psychology. The course in military psychology being offered at the University of Illinois includes the following: introduction, leadership and discipline, morale and motivation, perceptual problems, efficiency of military personnel, military placement, and personality adjustment. The topic of efficiency of military personnel is allotted 4 class hours of the total of 28 class hours. This topic embraces effects of fatigue on mental and muscular work, control of fatigue, and relation of environmental factors to fatigue. Five class hours out of a total of 28 class hours are devoted to military placement, which comprises tech-

niques useful in selection, determination of effectiveness in placement, interpretation of test results, and morale, discipline and effective placement.

It is thought that, in this general introductory course, somewhat more emphasis could be placed on psychology of military personnel work since the majority of military psychologists* now serve in Induction Stations, Reception Centers, and Replacement Training Centers and have full-time duties concerned with programs of personnel selection, classification and assignment, or closely related problems including test construction, administration, analysis of Army jobs, and personnel records.

II

What do military personnel psychologists do on these jobs? A classification officer who is trained in military personnel psychology usually has the specific duties of either Personnel Technician or Personnel Consultant. The classification officer is responsible for accomplishing the objectives of the Army personnel classification system in the installation to which he is assigned. Most personnel officers work at Reception Centers or Replacement Training Centers although some are employed by armies, army corps, divisions, oversea departments, defense commands, and service commands.

According to Army regulation (**13**), a Personnel Technician is a classification officer who is charged with the administration of classification procedure and policies, and a Personnel Consultant is a classification officer who counsels or supervises action on matters involving psychological principles and practices. Qualifications of Personnel Technicians include technical training and experience in personnel administration. Personnel Consultants must have sufficient academic background of a psychological nature to insure the necessary general insight into psychological problems of military personnel.

The duties of a Personnel Technician include initiating the Soldier's Qualification Card for all unclassified enlisted men; testing all enlisted men with the Army General Classification Test and

* It should be noted here that courses in experimental and in physiological psychology are basic to those few military psychologists who are working on special problems of perception, including night driving and flying, and related problems which are not primarily concerned with the classification of military personnel.

other tests developed or approved for this purpose by The Adjutant General's Office; and initiating a system whereby the Soldier's Qualification Card and other classification data are kept up. to date. A Personnel Technician must also be familiar with existing memoranda and headquarters directives on classification; must coordinate classification procedures employed in the various subordinate units to establish and maintain uniform procedure; consult with other Personnel Technicians; submit information to the commander of the unit pertaining to the functions of classification, reclassification, assignment and reassignment of soldiers; inaugurate and conduct conferences on classification procedures; and conduct schools for Army commissioned and enlisted personnel who are to aid in operating the classification system.

The duties of the Personnel Consultant are similar to those of the Personnel Technician. His duties may be somewhat more supervisory than those of the Personnel Technician inasmuch as he is charged with the responsibility of inspection and supervision of all phases of psychological work being undertaken in a unit; recommending assignment of personnel within the unit; coordinating the personnel program; supervising the administration, scoring and interpreting all group tests; and providing consultant services on all psychological problems pertaining to classification of military personnel including conferences and consultations with the general and special staff officers. He may assist the Personnel Technician in the conduct of military school courses on classification; may administer special tests and interviews to personnel requiring individual attention; and he may act as expert witness or adviser in conection with special boards and courts.

The assets of officers and technicians now consist mainly of their training in traditional courses offered in the fields of applied psychology. Their liabilities, the weak spots in the training of these military personnel workers, are caused largely by a lack of training in new subjects that are to be mentioned in section IV of this paper, as well as lack of needed emphasis on certain content in traditional courses listed in the following paragraphs.

III

The following list of courses contains chiefly the familiar course-titles which are to be found in most university catalogs. It should be noted that both content and emphasis stress practical application and opportunity for practice. It is assumed that departments

of psychology at present are offering these courses in applied psychology:

1. *Tests and measurements:* Survey of the most common general intelligence, aptitude and achievement tests; observation and practice in test administration; interpretation of test data for individual diagnosis and group appraisal; actual practice in construction of aptitude and achievement tests; elements of test evaluation.

2. *Personnel psychology:* General problems of personnel selection including use of interview, or letters of application and letters of recommendation, tests, and personal data records; psychological aspects of personnel management; morale and the employee interview as an aid in improvement of management-worker relations.

3. *Industrial psychology:* Production measurement; job analysis; techniques of motion and time analysis; relations of physical working environment to production; problems of monotony and fatigue; accident prevention and control.

4. *Clinical psychology:* Clinical methods, including individual tests for diagnosis; remedial techniques and procedures, with particular emphasis on special training, *e.g.* reading; actual observation and work with abnormal individuals who deviate to a large extent from the average.

5 *Vocational orientation:* Practice in test administration, counseling, interviews and test interpretation for appraising characteristics of the individual; interpretation of counseling data in terms of occupational requirements; practice in counseling individuals under supervision of instructor.

6. *Educational psychology:* Individual differences; principles and purposes of homogeneous grouping; methods of measuring outcomes of education and of interpreting related data; problems and principles of economy in learning; the elements of effective teaching.

7. *Statistics:* Methods of analyzing mass personnel data; methods of presenting and interpreting statistical indices with particular reference to data pertaining to evaluation of tests and personnel techniques; laboratory practice in computation, presentation, and interpretation of data; practice in developing and editing writeups and reports dealing with statistical findings.

Many courses in tests and measurements are superficial in the sense that they constitute merely a survey of existing test practices and very rarely include any content on fundamentals of test and measurement rationale. Students who have completed such courses therefore understand nothing of the fundamental logic of psychological measurement.

It will be evident to the reader who is familiar with Army training programs in classification that in the brief description of these courses, all offered to undergraduates or graduates in the larger departments, emphasis has been placed on that part of the content which will dovetail with the training eventually to be received by

student personnel officers and consultants in The Adjutant General's School (9), and with the duties of enlisted and officer military personnel workers. It will be noted by all that the emphasis has been toward the practical rather than the theoretical.

The following additional items of training may be suggested:

1. Occupations and occupational psychology.
2. Criterion development and appraisal.
3. Practicum in use of Army classification tools.

Occupational psychology. Courses in vocational guidance, student personnel work, and educational and occupational counseling overlap to some degree with the first item cited. These courses, however, are not aimed toward military personnel work, and do not completely satisfy the present requirements. They are useful but not sufficient. Courses in occupations must give a comprehensive view of the world of work with specific reference to knowledge of occupations having direct counterparts in military job specialties.

Courses in occupational psychology should include the psychological principles, methods, and results which may be applied to problems such as job analysis, interpretation of occupational information, and horizontal transfer of knowledge and skills from industry to military job specialties. These courses could well include a few weeks of intensive practice in the use of occupational tools developed by the Occupational Analysis Section of the United States Employment Service. Of these tools, the Dictionary of Occupational Titles is most widely used, Part I (3) of which gives concise definitions for 17,000 separate jobs. It contains 29,000 job titles of which 7,000 are coded and classified. Part II (4) of the Dictionary is a group arrangement of occupational titles and codes, and gives a comprehensive list of job titles classified according to their code; it constitutes the structure for classification of civilian occupations. Part III is least important for the present purpose, comprising a revision of certain occupational codes. Part IV (5) is designed to enable classification of inexperienced workers for on-the-job training on the basis of their potentialities rather than their job histories.

Although the history of occupational psychology dates back little more than a single decade, there is a sufficient body of knowledge to enable development of valuable semester courses of three to five hours, built around factual information available in the literature. Courses in occupational psychology should be co-

ordinated as closely as possible with local United States Employment Service Offices. Two such courses were developed at the Ohio State University by Harold A. Edgerton: Educational and Vocational Guidance Laboratory, and Laboratory in Employment Techniques. Close cooperation has been maintained with the local offices of the United States Employment Service. The training in employment techniques has emphasized participation and experience in guidance and counseling, supervised experience in employment interviewing, testing with work samples and group tests, classification and placement in the actual employment situation. Practice in the use of the Dictionary of Occupational Titles has been stressed as a basic part of the classification function.

Criterion development. Closely related and fundamental to the general field of occupational psychology are the special problems involved in criteria for worker efficiency. Few military personnel workers are sufficiently familiar with the necessity for, or methods used in, appraising performance of soldiers in their assignments. Since this problem of criterion development runs through the entire field of military personnel work—from techniques for test validation through transfer and promotion, to training problems—it is of primary importance.

In order to interpret and evaluate Army Classification Test data, it is standard practice to take into account validity of the tests employed. But the conventional textbook definition of validity is not too helpful. Validity indices must be interpreted in terms of the fallibility of the criterion used in evaluating the test. They must not be viewed from the traditional standpoint based on the arbitrary thesis that criteria are infallible. Evaluation of performance of soldiers and officers with a view to promotion and reassignment is an important function of classification officers. A number of sources of checking value of job criteria, and methods for checking degree of contamination have been considered by one of the present writers (1).

It is urged that the student be given the opportunity to work with actual data, to grapple with problems of test-criterion relations in his local situation, and to use item analyses against criteria. His eventual value as a military personnel psychologist will be greatly increased if he has "soiled his hands" with real data that are inevitably contaminated to some degree by influence of selection, subjectivity, and chance error.

Army classification tools. Practice in use of actual Army clas-

sification tools should comprise one of the minimum requirements for academic training of future military personnel psychologists. Of these tools the Soldier's Qualification Card* seems most important for practice use in the academic situation. According to Bott (2), in reference to record systems developed by psychologists in the Royal Air Force, there are three features essential to military personnel records: continuity, accessibility, and comparability. The Soldier's Qualification Card is routed from station to station with the soldier, so that it accompanies him from Reception Center to Replacement Training Center to school to combat unit, and is designed to give a continuous record that will be accessible and will contain data on the same items for all soldiers so that individuals may be compared with groups. Study of the function of the Soldier's Qualification Card articulated with practice in its use would give students a more comprehensive view of classification as it is actually conducted, and at the same time they would gain facility in the use of the basic Army techniques of interviewing, recording, and interpretation of data.

In the case of colleges and universities that have ROTC units this practical training in Army classification procedures could be given by conducting a classification program for the local ROTC Corps.** Another minimum requirement would seem to be close contact with classification officers in nearby military installations. A number of other classification officers are stationed at induction, reception and replacement centers, and a few are located in other units. Program arrangements for visiting these military classification locations, and for the military Personnel Technicians and Personnel Consultants to visit and discuss methods and problems with students on the campus, would result in a kind of liaison that would yield useful results.

IV

Sources of occupational and military personnel information, accessible to civilians and to psychology departments for instructional purposes, would include certain War Department Army

* This is War Department, The Adjutant General's Office, Form No. 20. Its description and use are given in an Army Regulation (11) pertaining to initial classification of enlisted men. It is also described in the special wartime issue of Occupations (10).

** This practical method of training was suggested by Captain Sidney Adams, Headquarters, Army Air Forces Technical Training Command.

Regulations and Training Manuals. Of these, the most essential are:

Army Regulations 615–25, July 31, 1942 (11)

This pertains to general aspects of recruit sorting and classification, testing and interviewing techniques employed, keeping soldiers' qualification records, and assignment of men to military duties.

Army Regulations 615–26, September 15, 1942 (12)

Section I of this document pertains to potentialities and abilities which the soldier brings with him to the Reception Center of the Army. This section sets forth the procedures used by military personnel psychologists designed for maximum utilization of these potentialities in classification.

In Section II the Army jobs are listed and defined. It shows how the Army can use the civilian training and experience that each man has had. For each Army job there is a listing of the civilian jobs that are related to it, or are civilian counterparts of it.

Section III is devoted to the problem of maximum utilization of men who are illiterate, who do not speak English, or who measure up very poorly on general intelligence tests.

Army Regulation 615–28, May 28, 1942 (13)

This includes general considerations of classification in Reception Centers and Replacement Training Centers and in divisions and separate military units. It also considers duties of Personnel Technicians and Personnel Consultants.

Army Regulations 605–90, May 21, 1942 (14)

Problems peculiar to Officer and Warrant Officer classification are treated. Procedures are specified for interviewing and testing, recording data on the officers and warrant officers qualification card (W.D., AGO Form No. 66-1), for officer assignment, reassignment, and for maintaining personnel records and related personnel functions.

Technical Manual—Test Manual (in press) (15)

This gives general information on statistical analysis of test data, describes approved classification tests in general terms, and includes specific information on interpretation of test results as needed by personnel workers who classify enlisted men.

V

Those who will select and classify men for the Armed Forces and industrial workers for the war effort, and who will during the longer period of demobilization lead in the reclassification, adjustment, and return of many millions to civil occupations, will perform their duties more effectively if they receive appropriate preinduction training. They must receive training in college personnel courses which will equip them to learn to cope with current problems basic in the application of psychology to military personnel work.

Especially pertinent to the needs of the Army is the request

that graduates of civilian courses in personnel psychology not be led to believe that this training will enable them to serve as Army personnel psychologists. They will realize that they " . . . will not be regarded as experts but as novices who must still serve an apprenticeship before the real value of their training can be apparent" (6).

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THE SUBCOMMITTEE ON MENTAL DEFICIENCY

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The formation of a Subcommittee on Mental Deficiency was voted by the Emergency Committee in Psychology at its meeting in May, 1941. The preliminaries to this action are of some interest as a record of developments.

In August, 1940, the present Chairman of the Subcommittee endeavored to promote the appointment of a committee on mental deficiency within the framework of the National Research Council. Such action seemed needed because of (a) the generally evident confusion in academic circles on the concept and methods of determining mental deficiency, and reflected in the controversial discussion of the effect of environmental stimulation; and (b) anticipation of more widespread and more effective consideration of problems of mental deficiency in relation to the growing national emergency with special reference to military problems and the civilian support of military enterprises. In respect to the former issue, it was recognized that the significance of mental deficiency had not been exploited in its scientific ramifications in the fields of anthropology, education, and the social and medical sciences, but had rather been viewed as merely practical problems in the field of social welfare administration and of special education. Confusion also existed as to the role of psychology in relation to medical science, particularly psychiatry, and in the detection of mental deficiency and its administrative disposition. The merits of academic controversy were confused by differences in orientation and concept, and the results of scientific inquiry were misleading because of scientific misunderstanding. It seemed as if many of these issues could be clarified by an authoritative body within the National Research Council.

With regard to the imminent problems of national welfare, both in the armed forces and in civilian life, the question of mental deficiency assumes an enlarged practical significance. It seemed advisable to anticipate these problems which *a priori* included: (a) the avoidance of inducting mental defectives into the armed forces; (b) the safeguarding of industrial production; (c) improvement in the occupational placement of mental defectives for greater social usefulness; (d) protection of mental defectives from the conse-

quences of social readjustments; (e) provision of optimum means for detecting mental defectives with reference to these considerations. It also seemed advisable to capitalize on the military and social experience with mental defectives incurred during the last war.

While efforts were being made to provide for these purposes within the National Research Council, the Emergency Committee in Psychology was established. In collaboration with the personnel of this committee, notably Robert A. Brotemarkle, assistance was rendered to the Personnel Procedures Section of the Adjutant General's Office relative to the selection and placement of mental defectives. The weaknesses of conceiving mental deficiency as a degree of intelligence below 11 years suggested the advisability of expanding this criterion so as to include social, educational, and occupational evidence, with particular reference to the capacity for adjustment and learning in military situations.

Consideration was also given to the specific problems of placement, training, and supervision, with special emphasis on the occupational usefulness of mental defectives in military service. At the same time correlative action was promoted within the American Association on Mental Deficiency designed to clarify the useful role of mental defectives in industrial and civil life, as well as to evolve the hazards of unrecognized mental deficiency with a view to obviating these dangers. The general outcome of these considerations was incorporated in the presidential address to the American Association for Applied Psychology at its September, 1941, meeting (1). This address, entitled "Scientific Freedom," was devoted to an over-all plan of utilization of psychological resources as illustrated from the field of mental deficiency.

Events led to the formulation of proposals to the Emergency Committee in Psychology regarding the importance of the issues and ways of meeting them. After considering the merits of this proposal, the Emergency Committee voted to establish a Subcommittee on Mental Deficiency with the responsibility for representing the interests of psychology in these matters. The following members of the Subcommittee were appointed: Florentine Hackbush, H. Meltzer, George Ordahl, Rudolf Pintner, Mary Vanuxem, and Edgar A. Doll (Chairman). The Subcommittee has the advantage of being represented by its Chairman on similar committees of four related national societies, namely, the American Association on Mental Deficiency, the American Orthopsychiatric

Association, the International Council of Exceptional Children, and the American Association for Applied Psychology. The program and accomplishments of the Subcommittee may be briefly summarized in outline form:

1. *Concept.* The Subcommittee considers its first duty to clarify the concept of mental deficiency with special reference to its practical bearing on both military and civil life. A syllabus has been prepared but not yet promulgated formulating this concept in terms of both history and status with reference to social competence, educational attainment, occupational proficiency, and intellectual level. This formulation is concerned chiefly with high-grade male adult defectives and pays some attention to etiological form because of the practical bearing of endogenous and exogenous causation on social adaptation. It remains to obtain general professional endorsement of this formulation, and to encourage its widespread use.

2. *Screening methods.* Supplementing this concept, the Subcommittee has been concerned with ways and means of substantiating it through both screening devices and the more elaborate process of extended clinical-psychological evaluation. To this end a tentative syllabus of rapid examination methods has been formulated. This has been supplemented by the preparation of an effective rapid interview designed to emphasize social aptitude or inaptitude for both military and civilian purposes. Some progress has been made in adapting the Vineland Social Maturity Scale for rapid separation of marginal deficiency from marginal normality, and particularly for the machine evaluation of personal interview data for the evaluation of social competence. Search has been made among the less familiar clinical and psychometric devices which give promise of speed and efficiency. Emphasis has also been laid on the basic importance of motor aptitude and coordination tests which are specifically relevant to military and industrial processes.

3. *Personnel.* An important project of the Subcommittee is the preparation of a specialized list of professional personnel experienced in specialties specifically relevant to mental deficiency. In collaboration with the Office of Psychological Personnel, preliminary lists have been prepared of psychologists who are experienced in the field of mental deficiency in such directions as teaching, research, and practice, and in such fields as welfare institutions, correctional institutions, welfare agencies, public schools, and indus-

try. The Subcommittee is also concerned with related professional specialties, particularly in the fields of education and social welfare.

4. *Coordination.* Recognizing the importance of collaborating with related professional agencies, the Subcommittee anticipates correlating its efforts with similar professional groups as well as with public institutions and agencies such as schools, clinics, and welfare bureaus. This includes the stimulation of collaboration with public institutions for the feeble-minded.

5. *Placement.* The Subcommittee hopes in time to extend its services in the direction of manpower utilization to such contacts as may be established with public and private agencies concerned, this to be accomplished as an advisory and promotional service to these agencies through the Emergency Committee. This includes specifically the preparation of occupational information designed primarily to facilitate the optimum usefulness of mental defectives in the armed forces, and secondarily in civilian life.

6. *Conduct problems.* As in the last war, there is already apparent a concentration of mentally defective women in camp areas and industrial areas, constituting a serious problem from the standpoint of health and morals. Preliminary work by one member of the Subcommittee clearly indicates the need for public action in this direction which, if effectively taken, will require an extension of psychological services to law enforcement agencies. A more immediate problem is the adequate disposition of military offenders who may be feeble-minded. Consulting advice on this problem has already been extended to one of our allies.

7. *Training.* Closely allied to the problem of placement is that of training designed to provide occupational readjustments or to increase effective utilization of occupational effort. Already military rehabilitation and special training centers have been established in which the problems of training and replacement of mental defectives have become acute. The importance of psychological service in this area is greatly increased by the present policy of not requiring mental defectives to be apt in all the fundamental duties of a soldier, but requiring rather that they be utilized as effectively as possible in some military capacity.

8. *Research.* The Subcommittee is concerned with promoting effective research of immediate value in the field of mental deficiency with special reference to military and civilian welfare. One such study about to be undertaken will be concerned with the present status of mental defectives discharged from public institutions

who have since been inducted into the armed forces or placed in production industries. It is impracticable here to enumerate the particular research projects which the Subcommittee would like to see pursued, but it is hoped that information will be received of special research studies completed, in progress, or contemplated.

9. *Post-war period.* It is anticipated that the efforts of this Subcommittee will be projected into the post-war period. Here the major problems will be such matters as the social readjustments of mental defectives discharged from the armed forces, or released from employment, or otherwise affected by the readjustments of peacetime. The ultimate outcome of the work of the Subcommittee may be the promotion of a sounder scientific orientation to the problems of mental deficiency, and a more effective utilization of psychologists in relation to the optimum social disposition of mental defectives in a total national economy.

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THE SUBCOMMITTEE ON THE SERVICES OF WOMEN PSYCHOLOGISTS IN THE EMERGENCY

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The Emergency Committee in Psychology recommended on November 29, 1941, that a subcommittee be appointed "to investigate the possible activities or services of women psychologists in the national emergency." The membership of the Subcommittee on the Services of Women Psychologists in the Emergency was established with a view to wide regional representation; the members are: Theodora M. Abel, Steuart Henderson Britt, Alice I. Bryan, Edna Heidbreder, C. M. Louttit, Bertha M. Luckey, Jean W. Macfarlane, Harriet E. O'Shea, Helen Peak, Ruth S. Tolman (Chairman). A meeting of this Subcommittee was held on January 10, 1942, and plans were discussed for more active participation of women psychologists in a situation which, since Pearl Harbor, was no longer an emergency but a total war. The various areas in which the psychological work of women could be utilized most helpfully were reviewed, plans were inaugurated for the assembling of information on work already under way, and special committees were appointed for the development of materials which would probably be useful in relation to war activities.

Two facts were important in the orientation of activities of the Subcommittee. The first was the realization that one responsibility for women psychologists necessarily would lead all others: the replacement of men in colleges and clinics. With large numbers of men entering the armed services, educational and clinical responsibilities will fall heavily upon women if psychological training is to be maintained and if problem children and defective children are to be cared for adequately. The second fact was the organization in December, 1941, of the National Council of Women Psychologists to function as an *action* organization through the development of local units, and to undertake community projects dictated by the needs of those communities. Accordingly, the present Subcommittee regarded its functions as fact-finding and advisory in nature, and various recommendations for action have been made to the National Council of Women Psychologists. Special recommendations have also been made to other women psychologists eager for participation in the war effort.

Preparation of materials. Among the projects carried out by members of the Subcommittee or at their instigation has been the development by Dr. Peak and Dr. Heidbreder of a series of tentative suggestions for undergraduate courses in psychology for women in the emergency (3). An outline and summary of materials on Training for Leadership in Civilian Life was prepared by Dr. Abel and Dr. Bryan, and copies have been distributed. Dr. Mary Shirley is preparing a review of the material on Children in War Time, covering the literature both in British and American journals.

Testing for Selective Service Local Boards. In Chicago, New York, San Francisco, Cincinnati, Washington, and other localities, many women psychologists participated with men psychologists in testing projects for Selective Service Local Boards until the time when other methods of selection were introduced. The Indiana Association of Clinical Psychologists also aided the Indiana State Medical Officer of Selective Service by compiling case studies and securing pertinent background data in doubtful cases which appeared before Local Boards.

Care of pre-school children. In Pittsburgh, Chicago, Cincinnati, and other places, women psychologists have carried heavy responsibilities in forming organizations for the mobilization of trained workers for the care of pre-school children. Dr. Elizabeth L. Woods, Dr. Dorothy W. Baruch, Dr. Mary Cover Jones, Dr. Mary Woods Bennett, and others are active in this program in California. In Cincinnati a program has been worked out by the Family-Child Welfare Committee of the Defense Council for the emergency care of children; and classes with laboratory work have been organized, with lectures by psychiatrists, psychologists, and other experts in the field of child development. Dr. Myra W. Kuenzel has been active in this program. Dr. Ruth Updegraff has served as Consultant to the National Commission for Young Children, which is composed of eleven specialists in psychological and social problems of children and which coöperates with Federal and State agencies throughout the country in organizing work for children in all states. Many women psychologists have participated in the opening of WPA nursery schools and in the training programs for volunteers in child care; they have also assisted in the preparation of brochures for parents on the handling of children in air raids and in other crises of war.

Selection of volunteer workers in civilian defense agencies. In

Cleveland, Milwaukee, New York, and other large cities, the help of psychologists has been welcomed in evaluating the services of volunteers and in selection and placement of workers. In Cleveland Dr. Luckey has played an active part in the development of such a program, organizing a group of psychologists to codify responses of volunteers and to evaluate the background and experience of the individual volunteer in order to determine his most useful assignment within the civilian defense organization.

Research in food habits. Dr. Margaret Mead submitted suggestions for research in the field of food habits which were circulated among members of the Subcommittee, and from time to time she has obtained their assistance in specific studies connected with problems of food shortages and proposed or actual rationing programs.

Occupational testing. Women psychologists in branches of the United States Employment Service are constantly devising and applying tests for various government agencies. Miss Barbara Anne Mayer and Dr. Phyllis Bartelme are two women psychologists engaged in this work on the west coast, and others are employed in Washington and in other branch offices.

Government Service. In the spring of 1941 at least 400 psychologists were employed in various branches of the Federal service (1). Of these, at least 10 per cent were women, and since then even more women psychologists have taken work in various government departments. Some women psychologists have joined the WAACS and the WAVES, either as officer candidates or as enlisted personnel, but the exact number is not known at this time.

Selection of WAAC Officer Candidates. During June, 1941, seven women psychologists served as representatives of Mrs. Oveta Culp Hobby on Interviewing Boards in the nine Service Commands throughout the country, assisting in the selection of Officer Candidates for the Women's Army Auxiliary Corps. This program has been previously described (2).

Other activities. A survey of activities of women psychologists in Texas, Louisiana, Mississippi, Alabama, Tennessee, Kentucky, Florida, Georgia, North Carolina, South Carolina, and Virginia has been carried out by Dr. Helen Peak, and a study of the professional work of women members of the Chicago Psychological Club by Dr. Helen M. Wolfle. Some of the services mentioned may be listed: adjusting college courses to meet the emergency; working with advisory committees of WPA nursery schools; serving on

National Committee on Volunteers for Young Children; assisting in special "morale" clinics; interviewing and classifying delinquents in the neighborhood of armed camps; lecturing on morale, child care, and mental hygiene; volunteer testing of nurses in training for army service.

Statements, written and oral. Since women everywhere are eager to be of service in connection with the war, certain groups have wished to hear specifically of the fields of psychology or the types of service to which women psychologists can direct their activities. Statements on this subject have been made at the Institute of Women's Professional Relations, and from time to time to groups of women undergraduate students in psychology at different colleges. A written statement, mentioning fields in which women psychologists were able to serve, was incorporated in the Proceedings of the Tolan Committee during a hearing dealing with the subject of women in war defense production. Women psychologists have been urged to register with the National Roster of Scientific and Specialized Personnel; and many special inquiries have been referred to the Office of Psychological Personnel, National Research Council.

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THE SUBCOMMITTEE ON LEARNING AND TRAINING

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The popular saying, "What you don't know doesn't hurt you," is probably less true in war than in peace. Parents and friends are usually far more disturbed by lack of any information than they would be by the full truth regarding absent soldiers and sailors. In a similar manner it is possible that some psychologists imagine that they are being "left out" of many extremely important and dramatic developments in their science, when as a matter of fact many of the activities of special committees of psychologists are far more routine and tedious than dramatic. An account of some of the activities of the Subcommittee on Learning and Training may, therefore, be of general interest to psychologists and serve as an antidote to the fear that something startling is going on behind closed doors. The membership of this Subcommittee is: Frank N. Freeman, Richard W. Husband, Fred S. Keller, Arthur W. Melton, Edward K. Strong, Jr., and M. R. Trabue (Chairman).

The Subcommittee has explored a large number of problems. One of the first of these, brought to the attention of the Chairman soon after the Subcommittee was organized in April, 1941, was that of the selection and training of women for occupations in defense industries. It was a relatively simple matter to discover that the United States Employment Service, through its Occupational Analysis Section, was already developing much more complete information in this field than any other organization or committee could possibly assemble without an extremely large appropriation and staff. A few months later this contact with the United States Employment Service was also recommended to Dr. Ruth S. Tolman when she was appointed Chairman of the Subcommittee on Services of Women Psychologists in the Emergency.

Another problem brought to the attention of the present Subcommittee was that of discovering suitable activities for school children to engage in during air raids. The Chairman worked with various school authorities in developing effective programs.

During the summer of 1941 the attention of the Subcommittee was drawn to a report that had been prepared in 1918 by two

psychologists at Camp Lewis describing a study in measuring and improving the coördinations of recruits in learning to use the army rifle. This experiment had made use of apparatus commonly found in psychology laboratories of that period, and had made it possible to improve the training process through synchronized objective records of breathing, trigger squeeze, and other coördinations. This report was brought to the attention of the proper military authorities in Washington.

The Subcommittee has also been concerned with demonstrations of the possibility of re-educating the visual habits of young men who have lost some of their skills in binocular vision. This matter was brought to the attention of the Chairman by a well-known clinical authority in the field of reading and vision.

One of the problems faced by every company commander in a modern army is the selection and assignment of men to give instruction in the routine operation of machines and equipment. This problem was presented to the members of the Educational Section of the American Association for Applied Psychology by means of a mimeographed letter in which suggested solutions were invited. The Subcommittee now faces the problem of getting practical aids organized and made available to soldiers who have instructional responsibilities thrown upon them. Another problem presented to the Educational Section of the AAAP was that of developing some skills of leadership in college boys, so that they would be more adequately prepared for service in the armed forces. Perhaps a booklet or magazine article will ultimately serve as a summary of the suggestions.

The correspondence carried on by the Subcommittee has been fairly extensive in volume and variety. Many correspondents are seeking guidance in their efforts to serve their country more effectively, and some are seeking subsidies for the conduct of further research on some psychological idea or device.

The most successful activity undertaken by the Subcommittee on Learning and Training grew out of a report which had come to the Emergency Committee on Psychology before the Subcommittee was organized, stating that many would-be airplane pilots were failing to receive "wings" because they were unable to master the international Morse code. The Chairman of the Subcommittee collected information from the War and Navy Departments regarding procedures that were being used in the instruction of recruits in the use of the code, and reviewed experiments that had

been carried on by the Signal Corps under the auspices of the National Research Council immediately after the previous war as well as studies by numerous civilians in more recent years.

Dr. Fred S. Keller of Columbia University, a member of the Subcommittee, had been an expert telegrapher previous to becoming a psychologist, and he readily agreed to explore the problem further, to analyze the experimental evidence available, and to plan improved teaching procedures that would be sound psychologically and sufficiently simple to be used in camps throughout the country. He made personal contacts with many different types of schools teaching the code, including the Signal Corps School at Fort Monmouth, New Jersey. On the basis of this experience and information, Dr. Keller developed new instructional procedures, and with the help of the Psychology Department at Columbia University, set up some experimental classes among the students of his own institution. Dr. Keller was also aided substantially by Dr. Spaulding Rogers of Hofstra College, Mr. Robert E. Taubman, a graduate student at Columbia University, and Professor Richard P. Youtz of Barnard College. These experimental classes made unusually satisfactory progress, making it appear probable that the amount of time being used in code practice by Army and Navy men was much greater than would be necessary if the improved procedures should be adopted.

Dr. Keller actually gave up his summer teaching position and salary, assembled his instructional materials, and went to the Signal Corps Replacement Training Center at Fort Monmouth, where he secured permission to demonstrate the new procedures. The conditions under which the demonstration began were most unsatisfactory. Adequate data on progress in code learning under the old procedures were, and still are, lacking; and control groups have thus far been impossible to obtain; but in a few weeks the progress of the experimental classes was so much greater than that of the others that Keller's method of instruction was adopted for exclusive use at this Training Center. Although it appears that the psychologically planned instructional procedures require considerably less time than the older official methods of instruction, it has been impossible to obtain scientific data on the difference, due to the fact that the Signal Corps instructors have not been willing to continue to use the older method since the newer one has become available. It is good to know, however, that the method is being adopted in other places throughout the country.

THE SUBCOMMITTEE ON A TEXTBOOK OF MILITARY PSYCHOLOGY

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America needs a textbook on military psychology. Pioneer work in this field was done in the United States in 1917–18, and American psychologists have advanced the knowledge of military applications of psychology to an extent far beyond that reached by any of our enemies. Paradoxically enough, the results of American research and observation in military psychology are available in the American literature only in fragmentary form. The Germans dignify military psychology and teach it formally, but the American students and Army and Navy officer-candidates are likely to gain such knowledge only by fortunate accident or through contact with a psychologist familiar with the field.

Yet only a few psychologists have direct knowledge of military problems and the ways in which psychological findings aid in their solution. With millions of American men taking up arms, how are enough of their leaders to know about the psychological tools at their disposal? And how can the officers and the more thoughtful enlisted men be put in possession of the psychological point of view toward the great human war machine? In this most mechanized of all wars, no machine exists in such great numbers, nor requires such expert servicing, as the human machine. None is so precious. And for no other is functioning at peak efficiency so vital to the winning of the war. It is for these reasons that the Emergency Committee in Psychology of the National Research Council is directing the writing of a text on military psychology.

The Army has always needed such a weapon. As long ago as August, 1917, the War Department's Committee on Education and Special Training suggested to Major Robert M. Yerkes, then Chairman of the National Research Council's Committee on Psychology, that a suitable course in psychology with special reference to its military bearings should be prepared for use in the Students' Army Training Corps. A subcommittee was appointed then and an outline prepared for these three courses (**1, 3**):

I. The Study of Human Action
II. Educational Psychology
III. The Psychology of Reasoning

The writing of a text for the first of these courses was begun, and the first six chapters were published in this *Bulletin* under the general title, *Outlines of the Study of Human Action* (2):

1. The Conditions of Human Action. By Raymond Dodge.
2. Individual Differences. By E. L. Thorndike.
3. Tests of General Intelligence. By L. M. Terman.
4. The Use of Intelligence Tests in the Army. By L. M. Terman.
5. How the Army Uses Individual Differences. By members of the Committee on the Classification of Personnel in the Army. (There were sections on Trade Tests, Development Battalions, and The Rating Scale.)
6. The Obtaining of Information: Psychology of Observation and Report. By G. M. Whipple.
7. The Learning Process. By E. K. Strong.
8. Morale in War and After. By G. Stanley Hall.

Although the outline also called for a chapter on the Principles of Leadership by E. H. Lindley, it was never published. The Armistice in November, 1918, terminated the project.

In the present war the project was discussed again in meetings of the National Research Council's Emergency Committee in Psychology. There was at first some doubt as to the practicability of the undertaking, as to whether a handbook or a textbook was wanted, as to whether the content was actually available. Then Harvard's Department of Psychology undertook to demonstrate the feasibility of the project by preparing outlines. Dr. Gordon W. Allport supervised the "dynamic" part, the present writer the perceptual part. The outlines were sent to the Emergency Committee, which considered the matter in May, 1942, and then established the Subcommittee on a Textbook of Military Psychology. The members of this Subcommittee are: Edwin G. Boring, editor-in-chief and chairman; Herbert S. Langfeld, editor on perceptual functions; Walter V. Bingham, editor on training, efficiency and selection; Gordon W. Allport, editor on motivation, morale, and personal adjustments; Edwin R. Guthrie, editor on leadership, public opinion, and psychological warfare; Col. E. R. Munson, Jr., of the Information Division of the War Department, military and editorial consultant; and Marjorie Van de Water, of Science Service, general writer, editor and Washington representative of the editor-in-chief.

The four editors reorganized their parts of the original outline and undertook to write some sections themselves, but for the most part "farmed out" chapters and sections to those expert collabora-

tors who could write a first draft of what was wanted. Forty-five psychologists have already contributed. The editors are responsible for collating the contributions of their respective sections of the book, while responsibility for synthesis and rewriting devolves on Miss Van de Water and the editor-in-chief. All these collaborators and editors are contributing their time, without expectation of remuneration; royalties, if any, will go to the National Research Council.

Of the fifteen chapters originally projected, first drafts of all but two were already completed on December 1, 1942. Some chapters not originally planned have been added, and work on collating is progressing. Some chapters are receiving advance publication in the *Infantry Journal.*

The following list indicates the subject matter that is being included. These are not chapter headings.

Human nature and combat	Personal adjustment in warfare
Sight as a military tool	Leadership
Hearing as a military tool	National and group differences
Smell and equilibration	Crowd behavior
Training	Rumor
Efficiency	Public opinion
Classification and assignment	Propaganda
Motivation and morale	Psychological warfare

In the rewriting, the style is determined by the audience selected. It is written for the soldier, the soldier who will read a book. Only that of immediate interest and usefulness to a man in the armed services is being retained. Material important to psychologists but of exclusively professional interest has to be set aside for possible use in later, academic editions if there is demand for them. An attempt is being made to keep the text vigorous, alive, practical, interesting, and free from any obvious parade of academic learning.

The book will be published with the imprimature of the National Research Council. General acknowledgment to collaborators and editors will be made if it does not seem inappropriate, but no specific assignment of credits and responsibilities will be possible. In general, there are no chapter authors. One chapter that began with a single author now has seven, and might still have more. It is hoped that a small book, in clear format on good yet inexpensive paper, with stiff paper covers—a book that might

sell for even as little as twenty-five cents—can be achieved. The proposed title is: "Psychology for the Fighting Soldier."

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THE SUBCOMMITTEE ON PSYCHOLOGICAL ASPECTS OF READJUSTMENT*

BY HAROLD E. BURTT
Ohio State University

The Subcommittee on Psychological Aspects of Readjustment consists of: Dean Frank N. Freeman, School of Education, University of California, Berkeley; Dr. Douglas H. Fryer, New York University, University Heights, New York; Dr. Charles S. Berry, Bureau of Special and Adult Education, Ohio State University, Columbus, Ohio; Dr. Harold A. Edgerton, Director, Occupational Opportunities Service, Ohio State University, Columbus, Ohio; and Dr. Harold E. Burtt (Chairman), Department of Psychology, Ohio State University, Columbus, Ohio.

The Subcommittee is addressing itself to various problems that will arise in the period immediately following the war. It is not concerned with extensive social planning of the post-war years. The immediate problems at the time of demobilization will involve two groups: (1) persons in apparently normal condition who must be adjusted back to civilian life; (2) persons who have had some physical or mental trauma and whose readjustment may be more difficult and may involve rehabilitation work.

The program, in process of organization by the Subcommittee, will necessitate coöperation with other agencies in its actual execution. The Committee is working on some of the more obvious problems at the present time, and is preparing plans, materials, and techniques.

* Because the work of this Subcommittee is in a planning stage, this report is purposely brief.

MORALE RESEARCH AND ITS CLEARING

BY GORDON W. ALLPORT
AND
GERTRUDE R. SCHMEIDLER
Harvard University

As long ago as November, 1940, the need for a central clearing-house to aid social psychologists in making their maximum contribution in the national emergency was foreseen. At that time a Washington conference of twenty-five psychologists was called by the National Research Council to consider "psychological factors in morale." This conference recommended in its report that such a clearing-house be established. Although various foundations were approached, no financial help was offered. Hence, instead of an adequately staffed and financially supported clearing-house, only volunteer service has been available to help steer the voluminous traffic.

Some may say that since social psychology nowadays is directly represented in governmental agencies, the problem solves itself. But the opposite is true. It is because of the increased psychological activity of governmental agencies that the work of psychologists remaining in colleges and universities becomes increasingly important. Not only are they potential collaborators of their Washington colleagues, but also potential contributors to all manner of local and national morale-building efforts conducted by private organizations. The problem then is to assist hundreds of nongovernmental social psychologists to find useful work to do, to put them in touch with those in the government or outside it who are most interested in the same problems, and to help them place the results of their work to best advantage.

In late November, 1941, following a conference with R. C. Tryon on some problems encountered by the Office of the Coordinator of Information, the Emergency Committee in Psychology of the National Research Council established a Subcommittee on Defense Seminars. The function of the Subcommittee was to stimulate, coordinate, and clear research in social psychology in different colleges and universities, through the organization of seminars which should carry on investigations useful to the government. The National Research Council appointed the following members to this Subcommittee: R. C. Tryon, F. H. Sanford, and

G. W. Allport (Chairman). Later G. R. Schmeidler assisted with the work.

Since there was no financial support for this service, it was necessarily conducted on a small and inadequate scale. Twenty-five contacts with psychological centers of research were initially made, of which twenty-three resulted in promises of cooperation. The following institutions participated: University of California (two groups), University of California at Los Angeles, University of Chicago, College of the City of New York (two groups), University of Colorado, Cornell University, Dartmouth College, George Washington University, Harvard University, University of Iowa, University of Minnesota, Northwestern University, Ohio State University, Rutgers University, Psychologists Club of San Francisco Bay Region, Sarah Lawrence College, University of Southern California, Syracuse University, Stanford University, and Yale University.

It soon became clear, however, that the activities of the Subcommittee could not be confined to contacts with these institutions. Too many psychologists in too many institutions wanted to help. Isolated individuals, undergraduate classes, local groups of various sorts became correspondents of the Subcommittee. Psychologists wanted to know how to establish Rumor Clinics, how to clear the findings of their local investigations of morale, where to place patriotic radio programs they had written—a thousand and one things—above all what they could do to help in the war effort. Meanwhile, government requests began to come from a great variety of agencies, of which the Office of the Coordinator of Information was only one. Help was requested in such diversified fields of service as the planning of public opinion studies, the interrogation of war prisoners, the analysis of rumor, the construction of morale-building courses, the analysis of foreign cultures.

At the same time, because of retrenchments within the universities and colleges, and because of the large number of psychologists leaving institutions of higher learning, the conduct of formal seminars grew more difficult. It rapidly became necessary to rely upon individual psychologists or upon informal groups to carry out the investigations. Before the autumn of 1942 it became clear that fully half of the most important work done by the Subcommittee had not been done through the formal seminar organization. Early in September, 1942, the Subcommittee recommended that it be discharged by the Emergency Committee, since the scope of its work did not in fact correspond to the initial conception of the Defense Seminars. This recommendation was accepted.

Looking backward for a moment to September, 1941, we find that at that time the Society for the Psychological Study of Social Issues had organized a Committee on Morale and Leadership Research. Alvin Zander, as acting chairman, was publishing a newsletter to members of the Committee to keep them informed of the work in progress. There was apparently some overlap in function between this group and the Subcommittee on Defense Seminars. Accordingly, following the discharge of the latter group in September, 1942, the SPSSI reorganized and extended its own work, naming G. W. Allport Chairman of a Committee on War Service and Research. The present Subcommittees are:

Clearance and Information (G. R. Schmeidler)
Leadership Research (Kurt Lewin)
Morale Research (Eric Wright)
News Letter on Morale and Leadership Research (Alvin Zander)
Field Cooperation (H. B. English)
Morale Measurement (A. R. Gilliland)
Children in Wartime (L. B. Murphy)

It should be reported also that a separate, important Committee of SPSSI is concerned with Psychological Considerations in Making the Peace, with Gardner Murphy as Chairman.

The variety of the requests received by the Subcommittee on Defense Seminars during its brief life, and of the requests now coming in to the reorganized office (operating now under the auspices of the SPSSI) is evidence of the need for some central way-station. The purpose of such an office, let it be said, is not to "coordinate" social psychology in any mechanical sense, but to provide some of the large amount of clearing and information service that seems unavoidable and necessary. It should be emphasized, however, that a great deal of the most commendable work is being done by psychologists who remain completely decentralized and merge their efforts altogether with those of local community agencies.

In an entirely new area of investigation, such as the psychology of wartime morale, definitions and boundaries are hard to establish. We list here some of the topics which our files show to be most commonly engaging the attention of social psychologists today. Taken together these topics seem to define the field of social psychology in wartime:

Assessing the state of morale in specific localities.
Information polls: public awareness of facts and issues.
Trend studies in public opinion.

Personality correlates of high and low morale.
Background factors in morale.
Attitudes toward nationality groups.
Fears of students in relation to the war.
Attitudes and reactions of children toward the war.
Care of children in air raids.
Panic prevention.
Case studies of individuals with low or high morale.
Current acceptance of traditional ideology.
Changes in personal ethics as a result of new conditions.
Attitudes of occupational groups toward economic problems.
Responses to priorities and rationing.
Factors affecting industrial morale.
Personnel methods in defense plants.
Work methods in defense plants.
Social and vocational rehabilitation of the unemployed.
War and postwar requirements for professional personnel.
Tests for leadership.
Methods of officer selection.
Special problems of military morale.
Optimal methods of presenting American ideas and goals.
Preparation of lectures on morale.
Analysis and execution of propaganda campaigns.
Preparation of propaganda leaflets and broadcasts.
Slogans: their popularity and efficacy.
Collection and analysis of rumors.
Rumor Clinics and other preventive measures.
"Listening posts": analysis of overheard conversations.
Analysis of newspaper editorial policy.
Nature of Axis radio propaganda.
Nazi and Japanese ideology, especially *Werttheorie*.
National character of the French, Poles, Germans, Japanese, etc.
Characteristics of minority groups in America.
Problems in race prejudice.
Studies in the nature and prevention of scapegoating.
Surveys of public opinion on postwar plans.
Psychological considerations in making the peace.
Postwar reconstruction problems.
Essentials for normal living.
Changing food habits.

PSYCHOLOGY AND THE WAR: NOTES

Occupational Bulletin No. 23 on Educational Services was issued by the National Headquarters of the Selective Service System on September 30, 1942. Although the listing of psychology was considered by responsible officials in various agencies concerned with the problem of critical occupations, psychology was not included in the final list. Although additional factual materials have since been prepared, it is difficult to predict the eventual results.

POFFENBERGER, A. T. Principles of applied psychology. New York: Appleton-Century Company, 1942. Pp. xvi+655.

The author's contribution to this field dates back to 1917 when he collaborated with Hollingworth in a book on this same topic. At that time it was essentially a pioneer effort. In 1927 Poffenberger assumed the sole responsibility for a revision. In the intervening period there had been marked advances in applied psychology,—many of them brought about by the first World War. In the years between that revision and the present one, there has been less progress in applied psychology as far as basic principles are concerned. Psychology has been applied by more people and in more places but progress has been rather in the extension of existing principles than in the discovery of a large number of new ones. Thus no radical change in the book was to be anticipated and none is found. The main differences are the inclusion of more up-to-date illustrative material, some readjustment of emphasis, the condensation of some of the introductory chapters and the inclusion of new chapters on radio and the jury. The emphasis throughout is on individual adjustment; in fact this is almost a key-note for the book.

The first chapters are somewhat preliminary dealing with race, age, sex, learning, and thinking. The chapter on learning is especially good and would be a credit to any psychology text. However, the content of these chapters should be largely familiar to the student with an introductory course in psychology. If the text is intended for this level, these chapters could be omitted without great loss and more time devoted to the topics discussed toward the end of the book.

Turning then to the industrial field, we have a consideration of work, rest and accidents, with rather brief emphasis on the last of these. The laboratory literature on noise is covered quite thoroughly and considerable effort made to reconcile contradictory results. There is an adequate treatment of the psychological aspects of illumination. Some new work on the effects of high altitude is mentioned. The author is wisely cautious about weather and climate. The chapter on monotony is especially good. The discussion of drugs is conventional but a good summary, and includes recent work with benzedrine. Next we have problems of vocational adjustment. The reviewer's only criticism here is the inadequate discussion of the employment interview which comprises only two pages although in actual practice it plays a very large role. The following chapter on opinion and judgment which are often used in evaluating people for vocational purposes, treats the sources of error quite extensively. In fact, the treatment is almost too thorough for a book at this particular level. The main points in rating scale techniques are discussed, followed by intelligence and special ability tests. The author prefers the term "character" where most of us refer to "personality" and elaborates this distinction. The chapter, however, handles this difficult topic effectively. The discussion of interests might well include a little more emphasis on Strong's interest inventory which is so widely used in practical situations.

We then turn to the effects of industrial specialization and standardi-

zation upon the individual. This entails considerable discussion of laboratory experiments on changing the type of work, mental set, perseveration. Some readers will dislike the inclusion of so much laboratory material at the expense of actual field work. Then follows a chapter on incentives which concludes with an excellent half-page summary of factors which make incentives effective. The chapter on reducing the cost of work subsumes under this heading many aspects of industrial efficiency such as economy of movement, methods of carrying loads, rest pauses. That is one of the best chapters in this portion of the book.

The chapter on "satisfaction" is the nearest approach to a specific discussion of morale which we find in the book. It is handled well except for inadequate treatment of the measurement of satisfaction or morale. For some reason the author avoids the term "morale" and does not even include it in the index. This seems unfortunate in view of the current widespread interest in the topic.

The discussion of advertising and selling is briefer than that of the preceding aspects of business psychology. There is a good concise chapter on distribution centering largely around wants and desires. Another chapter covers the usual ground in the psychology of advertising very briefly but effectively. A separate chapter is devoted to radio and discusses at some length the question of eye *vs* ear.

The book up to this point comprises twenty-seven chapters and the remaining eight are devoted to legal, criminal, medical and educational aspects of psychology. The first of these deals with the causes of crime and steers a middle course on the question of low intelligence as a factor in delinquency. There is passing mention of delusions, differences in inhibition, weather, drugs, suggestion from press and movies. This chapter covers a lot of ground in a hurry. The chapter on the witness touches upon illusions, errors of judgment, difficulties in memory. As to methods of crime detection the Association Test is stressed. There is a single paragraph on breathing and another on blood pressure. The reviewer believes that these topics should receive more emphasis, particularly in view of the fact that many officials (some of them inadequately trained) are using such procedures in practical work. At least it would be well to sound a note of caution regarding the use of these techniques by incompetent persons.

Experiments on jury procedure and differences in sentencing tendencies of judges are presented in some detail. As to treatment of the offender the emphasis is on the deterrent effect of punishment and the possibilities of re-education on the basis of individual diagnosis.

Turning to the medical aspects, there is a somewhat unique chapter which analyzes the psychological aspects of preventive medicine, and leads up to the general notion that it is necessary to "sell" this idea. With reference to mental disease, stress is very properly laid on the exciting causes in many of our social institutions. The diagnosis of disease is discussed from the standpoint of the introspections of the ordinary patient and the various symptoms which are diagnostic of mental disorder. There is some emphasis on frustration, and a straight-forward presentation of psycho-analysis. The chapter on treatment lists a dozen kinds of therapy which are essentially psychological, stresses rapport, and concludes with

an interesting recommendation of a psychologist attached to the general hospital.

The final chapter deals with education. The author indicates "Nowhere are these principles so universally applicable" as in the field of education, and justifies the limitation of this topic to a single chapter of fourteen pages on the ground that "practically all the matters dealt with in the preceding chapters have a direct bearing upon the problems of education." He feels it is sufficient then merely to indicate the main direction of educational psychology. Some readers will disagree with this point of view. However, he does high-light the important things such as the role of the individual as a unit in education, the possibilities of measurement of aptitudes and personality, the field of adult education, and the use of devices such as moving pictures and radio. He merely names a lot of the principles that have been discussed earlier and that fit into the learning aspect of education.

The aspect of the book that will be most seriously criticized is the relative emphasis on the different topics. Industrial efficiency, broadly construed, gets a more complete discussion than anything else. Education, as just implied, receives very little discussion in its own right. Medical and legal applications likewise receive comparatively scant treatment. However these briefer portions are nevertheless well done and the material is wisely selected. It would be impossible for any writer to cover the entire field of applied psychology and give a proportionate emphasis that would appeal to all readers,—or all reviewers.

The book seems to be aimed at the student with an introductory background in psychology. It is definitely not written down to the layman although the preface suggests that he can "read around" the more technical portions. For example, the author presents a correlation coefficient without any explanation of what it means and introduces factor analysis without any hint as to how it is done. On the other hand the author does introduce material, such as that on learning, that a student would have had in an elementary course.

There are numerous figures which are well selected and make the text more understandable. It is likewise very thoroughly annotated and will be of some value as a reference book. There is a bibliography of over 700 titles which will prove helpful to people running down the literature in this field.

On the whole, the book is comprehensive, well-written and readable. Aside from the matter of comparative emphasis the reviewer has no serious criticism. It will undoubtedly fill a useful place as a test book for courses on applied psychology.

HAROLD E. BURTT.

Ohio State University.

CRUZE, WENDELL W. Educational psychology. New York: Ronald Press, 1942. Pp. xvi+572.

The author explains that the preparation of this book was motivated by a long felt need, "for an elementary text for college courses in educational psychology that gives adequate emphasis to the practicality, as well

as other values, of the materials which it presents, that recognizes the unitary and developing nature of the student who peruses its pages, and that produces desirable changes in his behavior as well as his professional life." (iii) The point of view, depth of insight, content, and style of the volume are quite accurately indicated by this sentence.

The organization of the text is conventional and designed to focus attention upon the processes of growth, development, and learning. The style is simple, direct, and non-controversial, well suited to the needs of underclassmen who have not studied general psychology. Emphasis throughout is on a noncritical presentation of the more recent investigations of the traditional problems of educational psychology. The various theories of learning are given equally courteous and brief attention, the issues are not clarified: certainly there is no attempt at indoctrination.

In common with many texts in this field the book contains an abundance of material which can be memorized for examination purposes and a scarcity of material which can be understood in relation to the vital problems of education. After studying this book the student will know that W. F. Dearborn initiated *The Harvard Growth Study* but he will be surprised on testing his first class to find a range of eight years in reading ability. He will know that "homogeneous-grouping" represents another approach to the problem of individual differences but he will not know the extent to which trait differences nullifies such an approach. He will know the influence of marihuana, aspirin and fasting on learning but he will have no adequate set of principles to guide him in the organization of the pupil's learning experiences. He will know that the highest correlations between intelligence and achievement are obtained in the elementary school and the lowest at the college level but the only reason he will be able to give for this fact will be "that many variables other than intelligence influence academic achievement in college." (160).

Teachers of educational psychology who organize their courses around available experimental findings regardless of importance will like this text, those who organize their courses around the vital problems of the classroom teacher will not.

WALTER W. COOK.

University of Minnesota.

JORDAN, A. M. Educational psychology (3rd ed.): New York, Henry Holt and Co., 1942. Pp. xviii+597.

This book will stand favorable comparison with any textbook in its field. It is attractive in appearance, well organized, and interestingly written. This edition, like the two previous ones, is written in the best Teachers College tradition. It does not reflect any apparent consciousness of systematic position, although from a systematic point of view it could well be endorsed by Thorndike and Woodworth. Some sections of the book, notably those dealing with motivation, personality, adjustment of the backward and the gifted, will probably be well received by the "progressive" wing of American education, although again there has been no overt attempt to appeal to this group. "Progressive education" is not

conspicuously mentioned. The book is, however, quite modern in its fundamental educational outlook.

In Chapter 1 the student is favorably introduced to educational psychology. Chapter 2 combines much of the content presented in Chapter 2, Inherited Nature, and Chapter 12, Family and Environment, of the second edition. Some of the recent material regarding the IQ controversy is presented. The section on chromosomes, genes, etc., is retained. On the whole this chapter will probably prove to be interesting to the student.

There follow five chapters on learning. This conforms to the previous editions except for the omission of the chapter on elementary school subjects. Chapter 3, General Principles of Learning, treats chiefly nervous structure, conditioning, the traditional laws of learning, learning curves, and retention, the latter not very adequately, although some further attention is given this topic in a later chapter. The law of effect is not adequately treated. Chapter 4, Conditions of Learning, treats physiological conditions; psychological conditions, chiefly interests—a very good section; and educational conditions. Chapter 5, How to Study, is rather weak (what treatment of this topic is not!). In the chapter on transfer of training more might well have been made of the role of this basic phenomenon in mental development, and, in the language of James, of the pervasiveness of the phenomenon. No mention is made of the analytical investigations of the last decade, which might just as well be in a text for undergraduates. The treatment of transfer of school experiences, Chapter 7, is essentially the same as in the second edition—a condition that is true in large measure of all five chapters on learning.

Chapter 8, Individual Differences, is virtually identical with the previous editions. Chiefly it treats sex differences—only physical capacity and interests, adequately—and race differences. Maturation or Growth, Chapter 9, is considerably expanded over the previous edition, and is quite competent. Some of the topics expanded or added are emotions and interests, reading habits, and vocabulary and sentence structure. Personality Adjustment, Chapter 10, has been expanded a bit over the corresponding chapter in previous editions, and is quite polished. Chapter 11, Adjustment of the Backward and Gifted, is adequate. The chiefmodification of the chapter on statistical method is the addition of a section on percentiles. To the treatment of intelligence tests there have been added, chiefly, accounts of the New Stanford-Binet and the constancy of the IQ.

The treatment of achievement tests, Chapter 14, is rather on the poor side. It gives the student some knowledge of the concepts and parlance of measurement, but is unlikely to be of much help to the teacher in his own testing procedures. It portrays educational measurement of the 1920's. The final chapter, Measurement of Personality Traits, is good, although there is some question about its appropriateness. It is too much to expect teachers to make much use of the data. However, it does supply the student with some further knowledge of personality and its conditions.

The revision consists chiefly, and most importantly, in supplementation. Much, perhaps the larger part, of the text is more or less identical with that of the second edition. The supplementation, which is frequently made by way of adding paragraphs or pages at the end of various sections of chapters, is skillfully made. There is, to be sure, some reorganization of

the chapters, a few pictures lend human interest, and the chapter and topic headings are more attractive than formerly. In some instances the orientation at the beginning of chapters has been improved.

J. B. STROUD.

State University of Iowa.

MURPHY, LOIS BARCLAY; LERNER, EUGENE; JUDGE, JANE; AND GRANT, MADELEINE. Psychology for individual education. (Edited by Esther Raushenbush). Sarah Lawrence College Publications. New York. Columbia University Press, 1942. Pp. x+306.

Written in symposium form, *Psychology for Individual Education* is essentially a critical evaluation of principles, methods, and teaching experience in a cooperative exploratory course in psychology at the freshman level. In recognition of the fact that entering students are deeply interested in problems of personal development and adjustment, from their own adolescent point of view, the materials of the course are heavily weighted on the clinical, social, and sex-physiology side. Only such traditional and technical materials seem included as will clarify these more practical issues of ordinary living.

The teaching methods use case-history and mock-council techniques, supplemented by field trips and laboratory demonstrations. The cooperative demonstrations in biology seem especially effective. Instruction is highly individualized, on the basis of personality type and previous experience. Topics are selected primarily on the basis of student interest. From the authors' conclusions, one is convinced that such an elementary exploratory course is of decided practical value to entering college students. On the other hand, there is always the danger that such general orientation courses may supersede or block the more tedious, difficult, but absolutely necessary basic disciplines of "pure" psychology.

Because of its very simple, non-technical, informal presentation, the book should have a wide appeal to parents, teachers, mental hygienists, and others primarily interested in the practical problems of guidance and personality. It should likewise interest all teachers of elementary psychology courses.

From the point of view of materials and organization, Chapter I is outstanding.

MARTHA GUERNSEY COLBY.

University of Michigan.

SEASHORE, ROBERT H. (Ed.) Fields of psychology: an experimental approach. New York: Henry Holt, 1942. Pp. iii+634.

The expanding literature and the increasing degree of specialization have created an enormous gap between the textbooks and the research substance of psychology. Two general classes of efforts have been made to bridge this gap: (1) books have been written describing specific experiments or groups of experiments in the traditional field of "general" psychology; (2) other books have reviewed in generalized fashion the materials included within each of the special branches. Seashore and his ten collaborators present the first volume devoted to specific experiments in

these special fields, as follows: general experimental (Buxton), physiological (Lindsley), comparative (Harlow), developmental (Wellman), educational (Wolfle), vocational (Williamson), industrial (Musgrave), avocational (H. G. Seashore), social (Farnsworth), abnormal and clinical (Conklin), systematic (R. H. Seashore).

The authors propose to portray the breadth and diversity of modern psychology, and at the same time to create a picture of essential unity. The editor adopted two devices as means of achieving the latter goal. First, each of the major sections of the book would illustrate how *experimental methods* had been applied in the several special fields, and thus the book would have methodological unity. But the editor did not rely entirely upon the hope that the student would perform the difficult task of educational generalization spontaneously. In an introductory chapter, and in two concluding chapters upon convergent trends in theory and experimentation, he attempts to explicate the meaning of such an integrated outlook in psychological science. These conceptions of editorial responsibility represent a decided advance over practices found in previous books of this general type, even though the unity sought is imperfectly achieved.

The reader with a strict methodological conscience will worry about the use of the term "experimental" as applied to many of the investigations. For here the term experimental denotes almost any kind of empirical investigation. In addition to studies conforming to the traditional logical structure of a scientific experiment there are studies in factor analysis, a description of the University of Chicago "experiment" in undergraduate education, vocational guidance procedures, personnel procedures, and an account of the more widely used personality inventories. From the point of view both of psychologists and of psychology students, wouldn't it be better to restrict the term "experiment" to the kinds of scientific behavior regularly denoted by this term in the universe of scientific discourse? This attitude does not imply a disparagement of these other kinds of investigation, many of which must precede genuine experimentation, and which often are the only kinds of investigation possible.

It is perhaps a moot pedagogical issue, with books of this type, whether the account of a specific experiment should indicate its general scientific setting and status. The procedure in the present volume varies among the several authors, but there is one outstanding case of failure to suggest the highly controversial nature of the interpretations presented. This instance is Wellman's section on developmental psychology, which consists principally of an account of certain Iowa studies on the variability of the IQ. It could be argued, as the editor suggests in his preface, that the results of an investigation should be left to speak for themselves. But these results are quite definitely interpreted to speak for the author's point of view, without even a footnote reference to criticisms. In striking constrast, Lindsley's section on physiological psychology is a careful and scholarly appraisal of the specific experiments in relation to their setting in the larger scientific field. In similar fashion, if somewhat less systematically, Harlow, Wolfle, Williamson, Farnsworth, and Conklin all manage to establish a broad educational orientation in the field as a whole.

(Conklin does however fail to mention the criticisms of Maier's work on audiogenic seizures.) To the degree that this desideratum is not realized, the authors of such a volume become mere abstractors, and the product is likely to be misleading to students and troublesome to instructors.

But when this collective effort is viewed as a whole, its assets definitely outweigh its liabilities. Despite the unevenness in the quality of the writing and in the choice of representative experiments, the reader will carry from it a lively realization of the broadening scope of modern psychology. Furthermore, the student will learn far more about how psychologists actually carry on their work than he could ever discover in a textbook of second-hand generalizations. Like good research films, the many excellent individual chapters, too numerous to mention, will be invaluable in supplementing lectures and textbook readings.

LYLE H. LANIER.

Vassar College.

MILLER, JAMES GRIER. Unconsciousness. New York: John Wiley and Sons, 1942. Pp. vi+329.

According to the author there are two ways by which unconsciousness may be studied. One, and by far the most common, is by the clinical method. The other is by the experimental method. There is some tendency to combine these methods, but the tendency is not as great as it should be.

In considering what is meant by unconsciousness sixteen different definitions are presented ranging all the way from inanimate or subhuman to unavailable to awareness. No one of these definitions is accepted as correct but any one can be meant when the term unconsciousness is used. In later discussions where any particular meaning is desired it is indicated in bold faced type.

The usual method of studying the unconscious (any meaning) has been by introspection. Such a method presents a paradox for how can unconsciousness be studied by conscious (attentive) methods. But such a method together with the case history method is defended along with the experimental method.

The neurophysiology of unconsciousness presents a serious difficulty. One theory locates consciousness in the cerebrum and unconsciousness in the thalamus. The evidence for this theory is based upon such things as Pavlov's experiments in conditioning and the pathological studies of Cannon and Bard. But all this evidence is "suggestive rather than convincing." Other writers have presented the theory that both consciousness and unconsciousness are located in the periphery, some claim in the receptors and others in the effectors or possibly still others would locate it more accurately in the whole neuromuscular system. The difference between consciousness and unconsciousness by this theory is to be explained in terms of neural vigilance.

When unconsciousness is defined as unavailable to awareness or unresponsive to stimulation some of the best methods of study are through hypnosis, sleep, anaesthesia, dreams and reverie. Although the evidence

is not conclusive most of such studies favor the lowered vigilance theory of the unconscious.

The study of limens was the first psychological problem to be investigated by elaborate statistical techniques. Much experimental evidence has shown that subliminal stimuli may affect behavior. For example, Collier found that geometrical figures in the periphery of vision and subliminal were selected from a series of figures much more often than could be accounted for by chance. This and other studies show that subliminal (unconscious) stimuli can affect behavior. The range of attention is also related to unconsciousness. The psychoanalysts have claimed a distinct demarcation between consciousness and unconsciousness. Studies of attention indicate that the differences are those of degree with complete awareness at one end of the continuum with complete ineffectiveness at the other, with degrees of attention (unconsciousness) between these extremes.

Of all the uses of the term unconsciousness one of its most important is in explaining associations in thinking. Why do we pass from one idea to another? Often the associations are not apparent. It seems probable that there are missing links in our chain of thought that are unconscious and yet they determine the course of our thoughts. In a somewhat similar way unconscious (insightless) elements often determine our best judgments. Great thinkers may arrive at profound truths by methods quite unknown to them. Some believe this is due to unconscious but nevertheless accurate thinking.

There is surprisingly little psychoanalytic emphasis in this text. Although reference is made from time to time to Freud and to psychoanalysis, this book is predominantly not a psychoanalytic approach to the unconscious.

The text is clearly and interestingly written. It is well documented and draws from many realms of knowledge. Possibly its most serious fault is the fact that the evidence on both sides of controversial issues is presented without an attempt to reach a conclusion. To some readers this will be considered a virtue. For those who wish a clear untechnical presentation of the facts concerning the various meanings of the unconscious and its significance in life, this text is recommended.

A. R. GILLILAND.

Northwestern University.

BOOKS AND MATERIALS RECEIVED

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KATONA, G. War without inflation. New York: Columbia University Press, 1942. Pp. x+213.

MENNINGER, K. Love against hate. Harcourt, Brace, 1942. Pp. ix+311.

RAY, Marie B. Doctors of the mind. Boston: Little, Brown, 1942. Pp. xii+335.

SCHILDER, P. Mind: perception and thought in their constructive aspects. New York: Columbia University Press, 1942. Pp. xii+432.

TOLMAN, E. C. Drives toward war. New York: Appleton-Century, 1942. Pp. xiii+118.

Bureau of Child Study and the Chicago Adjustment Service Plan (p. 391–430); High School Adjustment Service (p. 175–197); Chicago Tests of Primary Mental Ability (p. 148–150); Statistical Report Bureau of Child Study (p. i–xix). Four reprints from the Annual Report of the Superintendent of Schools 1940–41, bound in one volume. Chicago: Board of Education, 1940–41.

NOTES AND NEWS

The retirement of Dr. Grace E. Bird, for many years professor of educational psychology at Rhode Island State College of Education, has been announced. Dr. Bird has been appointed professor emeritus.

Dr. Ernest R. Hilgard, professor of psychology at Stanford University, was recently appointed head of the department of psychology to succeed Dr. Lewis M. Terman. Dr. Hilgard is now on leave in Washington, D. C. In his absence, Dr. Paul R. Farnsworth, professor of psychology, will be acting head of the department.

Dr. Salvatore Russo, has been made head of the department of psychology at Rider College, Trenton, N. J.

Dr. Leona E. Tyler, instructor in psychology, University of Oregon, was elected secretary of the Northwest College Personnel Association, at its annual conference held October 9–10, 1942.

Dr. Clifford T. Morgan, instructor in psychology at Harvard University, has been appointed assistant professor of psychology at the Johns Hopkins University effective July 1, 1943.

Dr. Curt P. Richter, associate professor of psychobiology at the Johns Hopkins University, delivered the second Harvey Society Lecture of the current series at the New York Academy of Medicine on November 19. He spoke on "Total Homeostasis."

Dr. Marcia Edwards, associate professor of education, has been appointed assistant dean, College of Education, University of Minnesota.

Dr. Leo A. Hellmer, consulting psychologist at the Wichita Guidance Center, has been granted a leave of absence for the duration to enter the armed services. Miss Audell Herndon, of Ohio State University, joined the staff of the Wichita Guidance Center as consulting psychologist, September 14, 1942.

Dr. Richard S. Solomon has been appointed Director of Personnel and Psychological Research of the Standard Register Company, Dayton, Ohio. He was formerly Director and Vice President of The Personnel Institute, Chicago, Illinois.

February 1943 Meeting

NOTICE

Because of the space requirements of the Psychology and War section, and the necessity of equalizing the pages in successive issues, the *Psychological Bulletin* from time to time needs critical and analytical reviews that will run from 10 to 16 printed pages (i.e. from 4,000 to 7,000 words) to supplement its customary critical reviews which usually run from 28 to 36 printed pages (i.e. from 11,000 to 15,000 words). Psychologists interested in preparing such reviews or who now have such reviews available are invited to correspond with the editor. There is also available a mimeographed statement regarding the preparation of articles for the Bulletin and another with regard to Book Reviews which will be sent to interested persons on request.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of PSYCHOLOGICAL BULLETIN published monthly (not Aug. or Sept.) at Menasha, Wisconsin, and Evanston, Illinois for 1942–43.

State of Illinois }
County of Cook } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Willard L. Valentine, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Psychological Bulletin and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, American Psychological Assn., Inc., Evanston, Illinois; Editor, John E. Anderson, Minneapolis, Minnesota; Managing Editor, none; Business Manager, Willard L. Valentine, Evanston, Illinois.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) American Psychological Assn., Inc., Evanston, Illinois, (no stockholders).

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is (This information is required from daily publications only.)

American Psychological Assn., Inc.

Sworn to and subscribed before me this 7th day of October 1942.

SEAL]——————————————HARRIET HIEHS THOMPSON

(My commission expires Mar. 17, 1945.)

Vol. 40, No. 3 March, 1943

Psychological Bulletin

THE MEASUREMENT OF ADULT INTELLIGENCE

BY RAYMOND B. CATTELL
Harvard University

Present Practice in Adult Intelligence Testing

Although the application of intelligence tests to adults—in colleges, industrial concerns, and clinics—has increased prodigiously since the impressive vindication of adult testing in the first World War (**135**), the present recurrence of an emergency, demanding administration of tests to large numbers of men unused to examinations, has in some respects caught psychologists technically unprepared.

Not that there is any lack of standardized, published tests. A perusal of the *Mental measurements yearbook* (**14**, **15**) and other surveys of mental test material reveals that there are now available, in English-speaking countries, no fewer than 44 intelligence tests either specifically designed for adults or ranging into such levels of difficulty that, although designed primarily for older children, they can also be used with adults.

All varieties of tests find representation in the adult range: verbal literate, verbal oral, nonverbal, perceptual, group, and individual. The following is a fairly complete alphabetical list of available tests:

1. ACE Test for College Freshmen
2. Alexander Performance Scale
3. Arthur Point Scale
4. California Test of Mental Maturity, Advanced Battery
5. Carl Hollow Square Scale
6. Cattell Scale III
7. CAVD Test
8. Chicago Nonverbal Test
9. College Entrance Board of Examiners Test
10. Coöperative Test Service Test
11. Cornell-Coxe Performance Ability Scale
12. Culture Free Intelligence Test, Psychological Corporation
13. Dearborn Anderson Formboards

14. Detroit Advanced Intelligence Test
15. Dominion Group Tests of Intelligence
16. Ferguson Formboards
17. General Intelligence Tests for Africans (Oliver)
18. Henmon-Nelson Test for College Students
19. Herring Revision of the Binet Scale
20. Kent-Shakow Formboard
21. Kuhlmann-Anderson Scale
22. Leiter International Scale
23. McCall, Herring, Loftus Comprehension Battery
24. McGill Picture Anomaly Test
25. National Institute of Industrial Psychology, Test No. 33
26. Ohio State University Psychological Test
27. O'Rourke General Classification Test
28. Otis Self-Administering Test
29. Otis Quick Scoring Test
30. Pintner Advanced Test
31. Porteus Maze Test
32. Pressey Classification Test
33. Progressive Matrices Test (Raven)
34. Psychological Corporation Test VI
35. Psychological Examination, Form D (Teachers College)
36. Revised Alpha Examination, Wells
37. Revised Alpha Examination, Bregman
38. Revised Beta Examination
39. Roback Test for Superior Adults
40. Snedden Disguised Intelligence Test
41. Thurstone Test for Primary Mental Abilities
42. Terman-Merrill Revision of Stanford-Binet Test
43. Tests of General Knowledge (Benge), A Disguised Intelligence Test
44. Wechsler-Bellevue Scale

This list does not claim to be exhaustive, and it deliberately omits highly specialized tests, such as those for conditions of mental deterioration by Babcock(6) and by Simmins (88). Even so, it is at first glance a sufficiently impressive window display; indeed, the adult-testing psychometrist may be led to consider himself richly equipped with 44 tests. Unfortunately, most of them mysteriously melt away when he addresses himself to any specific test program or becomes in the least exacting about technical requirements. Thus, the requirements of a group-testing situation reduce the available tests to about 32. Twenty-eight, being verbal, are unsuitable for groups containing individuals of foreign extraction or very uneven educational background. Eight are nonverbal, but may be said to jump out of the frying pan into the fire by making equally great demands on that purely manipulative

dexterity which enters into performance tests. Only six or seven can be considered nonverbal and nonmanipulative, but not all of these are purely "perceptual," *i.e.* free from pictorial, representative apperception.

Furthermore, a considerable proportion of these tests, in difficulty, style, and educational presuppositions, have every evidence of having been designed for college students, so that they are of uncertain validity and even inadequate standardization when applied to the general population. Fewer than five of the tests have any provision, either in the published norms or in associated research data, permitting an allowance in the calculation of adult mental level for the downward trend in average performance which occurs in timed tests for adults beyond 20 years of age.

Experience of applying the present adult tests to Army and Navy recruits is still too recent to have issued in any quotable, authoritative, psychological literature. But the writer has letters from two psychologists in England, where such testing began earlier, expressing surprise and some dismay as a result of applying well-tried and familiar adult college student tests to averagely gifted and decidedly older recruits. The style of the tests, the form of the instruction, and the type of knowledge or skill assumed were found by psychologists having clinical experience to be inappropriate and not conducive to fair measurement of abilities as judged by other criteria.

In this country the use of adult tests with recruits is now being energetically approached by several relatively independent groups of psychological workers and by a comparatively "clinical" process of trial and error which, in a year or so, may be expected to yield valuable observations (**3**, **46**, **68**). A few comments are already published. Thus Atwell, Bloomberg, and Wells (**5**), reporting on the practice at a New England army induction center, state:

> It was originally believed that the verbal items of the Wechsler-Bellevue Intelligence Scale, supplemented by a vocabulary test and alternate arithmetic questions from the Alpha test, would be satisfactory for those cases in which verbal tests could be justified. The selection of non-verbal tests caused more difficulty, but it was expected that the Beta Block Counting test, the eleven, twelve and fourteen year levels of the Porteus mazes, and the third, fourth and sixth designs of the Wechsler-Bellevue Block Design test would be relatively useful.
>
> The lack of non-verbal material that would be adequate and not time consuming was keenly felt, not only with selectees with foreign backgrounds, but also with many who lacked skill with their own language.

An equal sense of dearth has been felt by other workers with noncollege adults. Thus, Weisenburg, Roe, and McBride (**129**) preface their 1936 study of adult intelligence with the observation that, "while some few intelligence tests for adults exist, notably the Army Alpha and the various examinations for high school or college students, none was sufficiently comprehensive or sufficiently analytical. . . . In any case, all the tests for college students could immediately be eliminated as too difficult for the average adult." A good deal of the military personnel work at the moment seems to be carried out by means of a general classification test, substituted for Army Alpha, and containing "arithmetic, box counting, and vocabulary items, to represent numerical, reasoning, spatial and verbal abilities" (**46**); while the Navy directive indicates the use of the Kent EGY, Porteus Maze, and Bellevue-Wechsler, with various additions.

The present dearth of tests must come as a shock to most psychologists, for it has been widely assumed that the momentum of real progress in intelligence test theory and practice which arose in the first two decades of this century has continued unabated through the ensuing 20 years. Indeed, most psychologists not actually engaged in research in the field are given to thinking of intelligence testing as a comparatively closed issue. A sharp medicine for this illusion is provided first by the dilemma of the practicing psychologist when he casts around for actual tests suitable for adults in the present emergency. He finds himself, indeed, scarcely better equipped than Yerkes and his co-workers (**135**) in the memorable enterprise of 1917. It is but a few years, in fact, since Wells (**130**), with unrivaled experience of the situation, remarked that the reappearance of the Army Alpha "a decade and a half (after its first use) may find the informed reader somewhat puzzled as to the reason for its rejuvenation. The reasons center around the considerations that for all its technical defects it is still the most widely standardized of adult 'intelligence' tests."

But the illusion is even more painfully shattered by the further discovery that the inadequacy which appears in adult intelligence testing is only a particularly obvious outcropping of a weakness that runs through the whole structure of intelligence test practice. This weakness, in fact, goes back to the fundamental theory itself.

The most natural assumption, on first glancing at the problem, would be that the progress of adult intelligence testing has been at a standstill because of certain difficulties peculiar to the testing

of adults. Certainly a brief acquaintance will show that many technical obstacles have to be overcome which do not appear in the testing of children and which probably exceed even the special difficulties encountered in testing infants. Chief among these are:

(1) The greater need for freeing adult tests from assumptions of uniform knowledge, education, and skills. This arises from greater variability among adults in their remoteness from schooling and from specialization of interests owing to occupational concentration.

(2) The comparative difficulty of achieving a test standardization based on really adequate sampling and the consequent uncertainty regarding the true mean and standard deviation of adult scores.

(3) The unsolved problem of devising a means of expressing scores in comparable and meaningful units, usable for all purposes. In this is involved the problem of fixing the denominator of chronological age to be employed in calculating adult intelligence quotients.

(4) The difficulty created by the age decline of test scores on speeded (timed) intelligence tests among adults. This leads to new problems of standardization and raises questions about the nature of intelligence.

(5) The lack of success which has met all efforts to discover intelligence subtests having a validity and predictive value for adults as high as those obtained for the subtest varieties used with children.

Data and viewpoints on each of these problems of adult testing will be reviewed later in this article, but it is necessary to precede such discussions by facing the fundamental problem we have already mentioned, the problem which adult testing shares with all intelligence testing—namely, that concerning the nature of intelligence. For every one of the above problems, in any case, goes back to this basic question. If we begin eliminating schooling and particularly verbal and number skills from adult intelligence tests, we are quickly pulled up by those who insist that these abstract operations are the very essence of intelligence. When we debate the scatter of adult intelligence scores and the true IQ means for various occupations, we immediately encounter the fact that some intelligence tests, particularly those consisting largely of perceptual subtests, give a much greater standard deviation than we are accustomed to find in Binet tests. The accepted scatter and even the degree of constancy of the intelligence quotient depend on the choice of subtests to be accepted as intelligence tests. The age decline of intelligence in "speed" but not in "power" at once provokes a controversy on the meaning of intelligence. Discussions of validity and predictive power of adult subtests naturally lead immediately to the same issue and so on through various aspects of adult testing.

In short, the present status of adult intelligence testing cannot be meaningfully discussed without a considerable digression on theories as to the nature of intelligence. It is the absence of such discussion and the assumption that this field of research is a closed book which are almost entirely responsible for the present chaos in adult intelligence testing. That this chaos cannot in practice be so easily hidden as in the less exacting field of child testing is perhaps fortunate for the progress of knowledge in mental testing.

Current Statements on the Nature of Adult Intelligence

A simile adequate to illuminate the present incredible state of affairs in intelligence theory is not easy to find. It is as if one came prepared to view a museum of prehistoric animals and awoke to a nightmare realization that the monsters were alive and loose. Every definition of intelligence that roamed the textbooks and articles of 1910 (**80**) will be found flaunting itself openly or lurking dangerously implicit in the technical literature of 1941. Mostly, however, these superannuated concepts have to be dragged into the light, often to the embarrassment of those in whose work they have been implicit. For it has recently become fashionable to be exacting about "test validation" while shunning all reference to the nature of intelligence itself. One may sympathize with a conversational taboo on so unpleasantly derelict a subject!

However, rather than study what is actually done by test constructors, we will first deal with explicit statements, in so far as they are obtainable, for it would be unfair to judge aspiration by actual performance. In a field beset with such practical difficulties the test designer is entitled to expect from the onlookers the old indulgence demanded in "Do what I say, not what I do."

At once, in reviewing the recent literature, one is struck by the prevalence of most of the classical definitions of a generation ago.

One finds Binet's "intelligence is judgment, or common sense, initiative, the ability to adapt oneself." Then various equivalents of Burt's "innate, all-round mental ability" (**18**). Terman's "ability to think in terms of abstract ideas" has numerous unconscious imitators (**101**). Also one finds Woodrow's "the capacity to acquire capacity," and Thorndike's "the power of good responses from the point of view of truth." But many of the modifications and elaborations of these propositions cannot be considered improvements. Theory has gyrated rather than progressed. Is Henmon's "Intelligence is capacity for knowledge and the knowledge possessed" (**51**) any advance on Woodrow's neat "capacity to acquire capacity," or Freeman's "functional adaptation" (**37**) any

improvement on the accuracy of his earlier concept? (**36**) Because of the many unblushing reinstatements of once-abandoned errors, one cannot avoid the conclusion that some of the recent clinical authorities are innocent of the original derivations of their ideas.

Broadly viewed, the more valuable and less obviously fallacious of the definitions and obiter dicta today fall precisely under the same three general headings as could be found 20 years ago, representing the best thought of three different fields: (1) clinical study of the defective, (2) biological observation and animal experimentation, and (3) educational measurement. These respective representative definitions issuing from these fields are; (1) the capacity to think abstractly, (2) the ability to learn, and (3) the capacity to adapt means to ends. Apart from mere circular definitions which use the expression efficiency and define ability tautologically as efficiency of performance, or vice versa, all important definitions seem classifiable in these categories.

Wechsler, in his Bellevue Scale manual (**127**), defines adult intelligence as "the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment." But Wells (**15**, p. 265), deploring the fact that Wechsler's concept of intelligence involves adding up the subtest scores into a single total, says: "The chief use of global scores is administrative."

Pintner evidently takes the view that intelligence is what has been measured by past intelligence tests, for he validates his tests by correlating them with other well-known intelligence tests; Bellows (**15**, p. 238), in his evaluation of the Pintner tests, readily accepts this as a satisfactory proof of their measuring intelligence. This practice is widespread, and its theory is often explicitly stated.

A number of psychologists have discovered that it is rewarding to say boldly what intelligence is not, while being extremely cautious of saying what it is. Thus Keating, in a review of Alexander's Passalong test, says (**15**, p. 237): "The test correlates low with the Stanford-Binet ($r = .21$), a point perhaps in its favor as a non-verbal test; . . ." The argument runs that, other things being equal, a test of nonverbal intelligence is one which avoids measuring what verbal intelligence tests measure. Perhaps Keating is himself displaying a too exclusively verbal intelligence in this syllogism, but it is at least widely accepted among clinical psychometrists. An equally curious logic of mutual exclusion is found in Wechsler's view that the revised Army Beta test should not be considered a substitute for a performance test of intelligence because the tests "involve functions which measure very much the same things that verbal tests do, except that the raw data furnished the subject are given in pictures and symbols and not in words" (**15**, p. 242).

Many designers follow the practice expressed by Amoss in the manual for the Ontario School Ability examination (**137**), which aims at "the

elimination of all special skills," and some stipulate specifically that "performance" skills should be avoided. Conrad says that "performance tests do not, to date, correlate sufficiently well with mental tests to serve as an adequate substitute," but adds that in adult tests "language and vocabulary factors should not be overweighted" and "differences of ability or facility in reading and writing, and differences in sensori-motor speed or acuity should have a minimal effect" (op. cit., p. 77). Porteus would also, curiously enough, rule out nonverbal abilities from his concept of intelligence as measured by the ordinary intelligence test, for he remarks: "I doubt very much if we can ever substitute a non-verbal for a verbal test any more than we can substitute a musical test for one in mathematics."

The most prevalent of all viewpoints, among those who venture to express positive statements about the nature of intelligence, is no different from that found among the first experimenters with tests 40 years ago. It is implied in the notion that intelligence is to be measured by sampling as many abilities as possible.

This view is sponsored by Kuhlmann when he criticizes the Otis test because its subtests (**15**, p. 235) are "lacking in variety, resulting in the reduction of the number of abilities measured by the battery." On the delicate, not to say crucial, issue of what tests are to be thrown into the pool, Kuhlmann, in the manual for the Kuhlmann-Anderson tests, remarks: "We have depended on common sense analysis in the selection of tests." An equally arbitrary pooling procedure is found in the ACE test, in which it is considered desirable to divide the test into two "kinds of ability," linguistic and quantitative, and to weight the first to double the second to give a final measure of mental capacity. The California tests (**98**) logically extend their sampling (since there is clearly nothing to forbid it in this general theory) to tests of visual acuity, hearing, motor coördination, and memory.

Although the "sampling" view is often adopted out of naïveté regarding theoretical issues, or from a failure to see any need for further progress, it is also found among psychologists of great experience, sophistication, and theoretical acumen. Thorndike states it in a more developed form with regard to the CAVD test (**112**), which, however, by yielding three distinct scores, indicates a belief that sheer sampling is not enough. Thus, there is (1) a measure of level of achievement or altitude, measured by the level at which the person succeeds in half the items, (2) a measure of width at a particular level, *i.e.* the per cent of items passed at a given level, and (3) area, the sum of successes at all levels, which corresponds most nearly to a sampling measure. The fact that Thorndike found width to increase quite rapidly during adolescence and level very slowly would seem to indicate that level is most nearly the same as that which other intelligence tests are measuring. Thorndike's choice of subtests, however, is based on clearly stated general principles—namely, such reasonable assumptions as that "responding to parts, elements or aspects of situations is more intellectual than responding to gross total situations"

and that "responding to relations between objects is more intellectual than responding to objects" (112, p. 63).

Garrett seems to be representative of those who accept the sampling process with reservations, for, in commenting on the Kuhlmann-Anderson procedure of adding up different types of test performance, he states that, "since the abilities of school children are relatively undifferentiated as compared with abilities of adults, this is probably as satisfactory a method as any" (15, p. 226). Here, incidentally, is an implicit recognition that the intelligence testing of adults is more exacting with regard to technicalities of test construction and clarity of theory. Finally, one may remind the reader that a sampling theory is very explicitly worked out in the factorial theory of Thompson (106) and was, at least until recently, embodied in the consistent theory and practice of Burt (17, 18).

It is symptomatic of the general muddle that those applied psychologists who have been the most prolific designers and users of "intelligence tests" and who have so long and so uncritically accepted the sum of a hodgepodge of tests in the form of a single IQ measurement are now swinging—on no better evidence—to the opposite extreme of demanding that tests should yield measurements of separate abilities. They wish to proceed to measure special or restricted abilities without first having solved, or shown any means of solving, the problem of the existence and nature of a general ability.

Discussion among clinical and guidance psychologists during the last 20 years shows this unmistakable trend towards interest in measuring special abilities, though not all of it proceeds as if the problem of measuring general ability were settled. Among academic psychologists there has developed simultaneously a critical attitude to the global score and an emphasis on the need for measuring independent abilities.

Thus, Anastasi, in a review of the Terman group test (15, p. 250), criticizes it on the ground that, "for any problems requiring fine discrimination," a test which "attempts to measure in a single score such a composite and ill-defined characteristic as 'general intelligence' is unsuitable." She adds that "undoubtedly tests of separate aptitudes will gradually replace the general intelligence tests for this purpose." One wonders exactly what purpose is envisaged. Is it possible to predict performance in any special field from a measure of special aptitudes apart from general intelligence? And what are these special aptitudes or traits that are so accurately defined?

Elsewhere (2) Anastasi writes that "the measurement of 'general intelligence' is losing its prominence as a goal of testing. Individual as well as group differences are being sought on narrower and more clearly definable traits." If this is true—and our survey indicates that it is—it

simply shows that applied psychologists are trying to run before they have learned to walk.

One immediate result of this drift of opinion has been the production of tests claiming to measure special aptitudes. But the very people who instigated this trend in procedure have been the first to raise an outcry against the tests which have appeared! For the test designers inconsiderately failed to choose as test categories, *i.e.* special abilities, those which the enthusiasts seem to have privately considered the only defensible and reasonable ones.

Typical of the new tests is Van Wagenen's Unit Scales of Aptitude which test "five significant mental functions" (**15**). One of these significant traits of the mind is the "rate of comprehension of simple paragraphs." (The size of type is not specified!) The designers of the California test of Mental Maturity say (**98**) that "dealing only with mental ages and intelligence quotients obscures and ignores the separate important factors." They wish (very laudably, one feels, in view of the state of affairs in current mental testing) to "reduce the 'mystery' which has surrounded the meaning of mental age and intelligence quotient." So they offer a profile of separate subtest scores which "analyzes and summarizes the various factors which are measured by the test situations." The ACE examination recommends separate 'linguistic' and 'quantitative' scores (L and Q); but analysis with college students shows (**97**) that the Q score does not predict achievement in mathematics any better than the L score and is less accurate in this respect than the total score.

Concerning this procedure Kuhlmann comments (**15**, p. 209): "We do not believe there is much merit in labelling tests as regards functions measured . . . first, because it cannot be done correctly by inspection, and secondly, because these labels are not of much value until we know also how these functions enter into school achievement." The objections could scarcely be more reasonably and successfully stated. Wells, however, seems content to accept these self-styled categories of test designers. He speaks of "disparate functions as, e.g., vocabulary range, abstracting power and imaginative richness" (**15**), and approves of the use of a few well-defined subtests as in the Wechsler-Bellevue or Detroit Tests of Learning Aptitude because "one acquires a feel for a wide range of responsive adequacies both quantitative and qualitative that is not approached with numerous discrete items of the Binet type" (**15**, p. 254). Similarly, Garrett (**15**, p. 257) comments on Thurstone's "Tests of Primary Abilities": "From both the theoretical and practical points of view such an approach is vastly superior to that taken by makers of omnibus tests who hope by averaging scores on a hodge-podge of functions to obtain, finally, a measure of some worthwhile ability." This observation, however, must not be classed with the other slumping theories above, since, as will become evident in the following discussion Thurstone's categorizing stands on a totally different footing.

In short, a survey of current literature reveals every possible

variety of divergence as to the objectives of intelligence testing. Intelligence is abstract thinking; it is concrete thinking; it is verbal skill; it is manipulative ability; it is innate; it is a set of acquired skills; it occurs equally in all activities; it cannot be measured by sampling; it is one thing; it is a host of things; it is a few distinct, clear-cut aptitudes. The "wave of the future" in intelligence testing is suspiciously like that in international politics. The theorists change their viewpoints with facile irresponsibility, bowing to the expediences of clinical or guidance fashion rather than to the impact of any new data or reasoning. When the reviewer comes to feel that confusion has surely made his masterpiece, he will find surprises still in store as, for example, when he encounters two or three quite incompatible viewpoints simultaneously held. One of the most popular of recent college textbooks for guidance workers and teachers (**44**, p. 260) tells its readers that "*intelligence is the capacity for learning, plus the useful information, skills and attitudes which the individual has gained from reacting to his environment.*" A page later, however, it has become just "*the power to learn.*" Of the first definition the writers say: "This rather liberal conception of intelligence permits it to fit into the educational program and also places in an acceptable light the majority of devices for the measurement of general mental ability." In short, a pleasant Utopia is guaranteed. Henceforth every test designer is guaranteed an "acceptable light" for his products, and every teacher is assured of an intelligence measurement adapted to the preconceptions of his local school system! The designing of intelligence tests, if not the passing of them, has been made foolproof.

The Means of Defining Intelligence

The regression that has taken place in precision of thinking concerning the measurement of abilities has naturally led to increased confusion in all associated problems. Whereas most results indicate a cessation of intelligence growth at 14 years, Thorndike (**111**) and Teagarden (**101**) discover that the curve does not flatten out until the late teens or early twenties. The problem is naturally insoluble so long as different experimenters employ different concepts of intelligence. Again, the whole development of a technical "scholastic engineering," whereby success in various school subjects can be analyzed in known vectors and predicted with known standard error, becomes vitiated by such fluidity of concepts. Finally, by such definitions of intelligence as that of Greene

and Jorgensen, the nature-nurture problem itself vanishes as does, for that matter, most psychological research directed to clarifying the field of abilities.

We are reluctantly compelled, then, to abandon the search for precise and tenable theories among the material of recent discussion and to turn with behavioristic sophistication to seeking the present definitions of intelligence through finding out what mental testers actually do rather than by asking what they think they do. This also has the advantage of enabling the survey to include the work of those test designers whose consciousness is unclouded by any such verbal superfluity as a directing theory.

A review of the literature associated with the 44 tests listed on p. 153 shows that the following methods of validation are about equally distributed among them:

(1) correlation with other intelligence tests, or subjective ratings of "intelligence";
(2) inspection for increase of score with age;
(3) estimation of efficiency of prediction of (a) scholastic or (b) social and occupation achievement;
(4) examination of amount of separation achieved between mental defectives or superior deviates and normals.

Less common and less uniformly applied methods are:

(5) examination of normality of score distribution;
(6) examination of internal consistency as evidenced by (a) subtest intercorrelations or (b) item analysis.

Many tests employ two or more of these criteria, without discussing, or examining experimentally, their compatibility. The Chicago nonverbal test, for example, uses correlation with chronological age, normality of distribution, correlation with other tests, and comparisons of normal and feeble-minded. The Henmon-Nelson test (**51**) validates against scholastic achievement, against other common intelligence tests, and through the comparison of individuals of "known superior and known inferior ability."

That the reactions of psychologists against some of these methods is not more unanimous may perhaps be most kindly ascribed to the dulling effect of custom. Spearman, it is true, entered a spirited protest (**14**) against basing the validation of the Stanford revisions of the Binet on the tendency of the score to increase with age and allowed himself to wonder why the mental testers did not simply judge the child's intelligence by counting his teeth. Among the tests which depend largely on age validation one

must mention the Kuhlmann-Anderson, the designers of which define the discriminative capacity of a subtest by the amount and steadiness of increase of score with age, and selected 35 out of 100 possible subtests because they showed the greatest and most consistent age increment. Garrett's comment seems adequate refutation of this practice: "Since physical strength, motor agility, and emotional control (to mention a few) all increase with age, mere increase in score with age is no guarantee that a test is an adequate measure of intellect."

Equally fraught with error is the method of comparing the truth of newer tests against the statements of older tests, or older preconceptions as embodied in estimates. Such deference to holy apostolic succession surely indicates the viewpoint of a theologian or a lawyer and has no place in science. Among physical scientists a physicist who checked the accuracy of a modern chronoscope against the fourteenth-century clock of Exeter Cathedral would rightly be considered a little too eccentric. The mass eccentricity of psychologists is hidden only from themselves. True, the comparison of a test with several tests removes statistically certain kinds of errors. It does not remove the error of whatever misconception is common to a whole generation of psychologists.

Almost as unsatisfactory is the comparison of tests on the basis of their discrimination of superior deviates, normals, and mental defectives for, as Doll is constantly reminding academic psychometrists (**32**, **33**), mental defectives do not differ from normals only in intelligence and "we in the field of mental deficiency greatly deplore the current tendency to segregate inferior deviates by means of intelligence tests alone." As for superior deviates, they may be anything from dictators or communist intellectuals to members of the Junior Leage or chess virtuosi—according to our social viewpoint. Quite apart from the mixed grounds on which individuals are judged as geniuses or defectives, we have to reckon with the well-known sociobiological fact of genetic adhesion of distinct psychological traits, as a result of class stratification and assortative mating. If epilepsy becomes linked with low intelligence because mental defectives marry epileptics, with greater than average frequency, are we to include epileptic symptoms in an intelligence measurement?

Among these shallow "rules of thumb" for constructing intelligence tests one can perhaps respect most the uncompromising statement of a certain class of applied psychologist that he is not

at all interested in intelligence but only concerned to establish a correlation between a test and certain kinds of life success (Criterion 3, above). This view is also given intellectual respectability by Thomson, who asks why psychometrists want to put such intermediaries as "intelligence," "mechanical aptitude," or "factor w" between their particular concrete tests and a particular concrete life situation (**124**). The alternative is to record that a particular test, say No. 5796, correlates 0.82 ± 0.03 with success in, say, the High School English course in Middletown, or that No. 64d yields a prediction, defined by a standard error of estimate of 40%, of vocational success as a street car driver under the street conditions of 1939.

Whatever may be said from a practical standpoint, about the shortsightedness of these techniques of avoiding intermediary reference values, the outstanding objection remains that they offend scientific curiosity itself. It is a sad day if psychology is in danger of forgetting that it exists for more than guidance or education. Moreover, countless important investigations have been made with the very definite common-sense orientation that scholastic or occupational success is not synonymous with intelligence. Success in any field is surely reasonably to be considered a result of intelligence, plus more specialized abilities, plus temperament and character traits.

Line and Glen (**65**), for example, investigated the relationship between classroom morale, intelligence, and achievement, and concluded: "The underlying cause of the varying degree of correlation between 'g' and school achievement appears to pertain to the efficiency of the motivation." Such an assumption—that intelligence is never the sole factor in any real life situation (as distinct from a controlled experimental situation)—is found in the researches also of Burt (**17**, **18**), Gates (**41**), Proctor (**81**, **82**), Miller (**79**), Madsen (**69**), and Shewman (**87**), to name but a few.

An even more fundamental objection to dropping reference concepts lying between the test and the situation is that life, as Heraclitus so long ago reminded us, is a constant flux. Success in English in School A will not correlate with a given test to the same degree as in School B. A test of engineering ability in 1920 may not prove a test of engineering ability as engineering is understood in 1950. A measure of social intelligence in Russia may predict only a proneness to social ostracism in New England (*vide* Gorki). Tests which need to be scrapped with every slight spatial or tem-

poral change are not very economical. On the other hand, if it is only necessary to re-evaluate from time to time the "real life" success situations in terms of a few unchanging reference factors, *e.g.* intelligence, mechanical aptitude, verbal ability, for which there are standard tests of known validity, psychometrics has some claim to be a science.

Lastly, we come to the validation of tests by internal consistency. This, unfortunately, means many things to many people. Some hold no brief for demanding high intercorrelations of subtests yet gladly proceed to "item analysis," rejecting items failing to discriminate in line with the whole test, which theoretically amounts essentially to the same process. Others, strangely enough, demand low correlations between subtests. Thus, Greene (**15**, p. 321) apparently approves of adult tests having subtests "selected to have high correlations with a criterion and low correlations with each other, as in the case of the United States Army Tests." Whatever else we may feel about this criterion, which is widely entertained, though less explicitly, by several clinical psychometrists (see, *e.g.* **97**), we have to add that its complete consummation is a logical and mathematical impossibility.

The question of internal consistency will be taken up afresh below. The remaining criteria can be briefly dismissed. Normality of distribution is found with thousands of measurements having nothing to do with intelligence and is sometimes absent from extensive intelligence surveys, as a result of systematic social and biological transformations. Finally, selection of subtests by "common sense," which has entered into test construction principles far more than designers are ready to admit, and which has saved them from the most hideous consequences of their own theories, has three drawbacks. The first lies in the very fact that it has saved psychologists from truly meeting their hypotheses face to face. Secondly, it must condemn them to forfeit any professional right to design tests, since the general public has quite as much common sense as psychologists; and, thirdly, the specific recommendations of 'common' sense do not, in fact, ever appear common to more than one person.

All in all, the validation procedures cannot be said to hide any richer or more precise concepts about intelligence than do the consciously elaborated theories, and frequently they are less intelligent than their rationalizations.

When one considers that a way out of this bankruptcy was

indicated at least a generation ago, first implicitly by Galton and then by Spearman (**93**), Garnett (**38**), Thurstone (**118**), Burt (**16**), Hotelling (**58**), Holzinger (**57**), Kelley (**61**), Thomson (**108**), Wilson (**132**), and other members of the galaxy of brilliant mathematical psychologists who have developed factor analysis, one is amazed that any competent psychologist is content to continue discussing and "investigating" tests in the limited language of clinical impression or within the shackling superstitions of educational tradition. Factor analysis does not bring in sight the end of all disputation, but it at least transports investigation to an objectivity far above that amateurish level of evaluating abilities which the psychologist has all too long been content to share with the layman.

The reluctance of the majority of American psychometrists to erect mental test practice firmly on a vector basis seemingly springs from very diverse and partly unconscious roots. First, there is a tendency to identify factor analysis with that armchair faculty psychology to which this generation of psychologists has been so strongly negatively conditioned. Secondly, there is the ancient suspicion of many clinical psychologists that error consists of lies, damned lies, and statistics. Thirdly, there is the fact that factor analysis is alien in origin, at least to the slight extent that English psychology is alien. Fourthly, there is a widespread impression that factor analysts disagree chaotically among themselves.

Only the last of these requires discussion. A persistent cause of misunderstanding is the continued statement by some psychologists of the Spearman two-factor theory in the form it reached a decade ago rather than in the more developed form admitting group factors (*i.e.* a three-factor theory) as it appears in the later work of Spearman (**94**) and Holzinger (**57**). Setting aside whatever is peculiar to the approaches of Hotelling and Kelley, which have not the same objectives as those analyses with which we are now concerned, we are left essentially with the varying systems of Spearman, Thurstone, and Thomson. The divergence is greatest between Spearman and Thurstone, on the one hand, and Thomson, on the other. But Thomson's disagreement with Spearman is one of interpretation rather than of statistical fact. As Guilford (**45**, p. 466) points out: "Thomson does not deny the possible existence of something that can be called 'general ability'." The decision between a general factor and a sampling theory cannot be made on

statistical grounds alone. But Spearman has given cogent general and empirical reasons for considering the general factor a more probable interpretation (**95**). Additionally, Thouless (**115**) has pointed out that the general factor theory meets the statistical facts with fewer specialized assumptions, whereas with the sampling theory a hierarchy is only one of several possible sequels. However, this disagreement is somewhat irrelevant for psychometric practice, since both theories can lead to the same procedure: the selection of tests which correlate highly with as many other tests as possible in the battery.[1]

Realization of the common destiny of the Spearman and Thurstone approaches has perhaps been obscured by a certain intransigence in both parties to the discussion. Thurstone's whole theory is, of course, essentially a most brilliant generalization of the special and restricted principles in Spearman's own approach (a generalization embryonic in Garnett (**39**)), arising from his perception of the wider implications of that penetrating pioneer work. It is probably unfortunate that when Thurstone entered upon this flight of creative thought he deliberately made difficult any return to the firm ground of Spearman's more pedestrian progress. For he introduced conditions which precluded his discovering in any set of correlations the simple general factor which Spearman had shown to be so widespread in its occurrence.

When Thurstone's epoch-making study of Primary Mental Abilities appeared (**119**), innocent of any general factor, Spearman (**95**) showed, by reworking the data which Thurstone so thoroughly sets out, that the experimental results were quite compatible with the emergence of a considerable general factor. A similar complete demonstration of the general factor resident in Thurstone's correlations was made by Eysenck (**34**). Guilford has shown that with a slight modification Thurstone's conditions will not preclude the discovery of a general factor. Thurstone's most recent study (**121**) splendidly confirms the seven or more group factors, on oblique axes, of his first study, but shows at the same time that these factors themselves can be analyzed into what he calls a "second order general factor," which he claims is uniquely determined. The convergence of Spearman and Thurstone is now

[1] Sampling would seem actually to indicate either of two procedures: (1) taking as many tests as possible that do not overlap at all, in which way one might miss large areas; or (2) taking tests which overlap greatly because they sample the greater part of the available sampling area.

complete, barring certain diplomatic formalities. Spearman finds certain group factors, and Thurstone has a general factor. But Spearman introduces his group factors to the reader with a cold and perfunctory politeness, while Thurstone's general factor is only permitted to enter society as a "second-order factor" after the "primary abilities" have made off with all of the actual test variance.

A masterly survey[2] of the whole psychological and philosophical status of factorial concepts has recently been made by Burt (**19**) in which he shows, as Holzinger (**56**) has done, independently, that the results of any one factor analysis may readily be transformed into any other. Far from being mutually incompatible, the present factorial systems of Thurstone and Spearman are closely akin. Thurstone simply absorbs into his correlated group factors that which Spearman first extracts as a general factor. The group factors found by the two schools are, or can be, the same. Thurstone chooses to make them more salient and positive, at the expense of the general factor and the special factors unique to each test.[3]

Factor analysis thus does not, as had once been hoped, put mental testing on a completely objective basis, above the tumult and the shouting of the educational and clinical market place. But it does exile arbitrariness to a remote and far more restricted plane. Instead of innumerable possible assumptions about traits, we are reduced to a handful of possible assumptions about methods of analysis. Psychological considerations and such general scientific considerations as the law of parsimony have been invoked to settle on the final system of factor analysis. Is a general factor psychologically and physiologically more likely than a number of

[2] In parentheses one may point out that Burt's genius for hiding highly germinal contributions in obscure publications has left many psychologists unaware of that repeated anticipation of later major trends which entitles him to an almost unique breadth of original authority in factorial issues.

[3] This conclusion is in accordance with Eysenck's in his reworking of Thurstone's data. "An analysis by Burt's procedure appears to reconcile the two conclusions; for, with Spearman, we discover a general factor, accountable for more of the total variance than any other, and with Thurstone (**34**) we discover a number of group-factors having a clear psychological meaning." Eysenck's analysis shows the probable outcome of most such general and group-factor analysis. The general factor accounted for 31% of the variance, and the group-factors for from 2% to 6%, *i.e.* the general factor is about five times as significant as any other.

linked group-factors? Are the criteria of Thurstone's "simple structure" analysis in fact more simple than the assumption that the mind operates as a whole? In the end we may have to admit mental traits by fiat. But the fiat can be decided by a ballot of psychologists on a simple issue of two alternatives—general factor or simple structure. For his part, the writer has no hesitation in publicly casting a vote for a general factor, since it retains the utility of group factors, while fitting in with the administrative convenience of an IQ and, what is far more important, with what is generally known about the mind.

The suggestion that mental testing be shifted wholly on to a factor basis cannot be left without reference to the practice of terming vectors "abilities." Whereas many psychometrists seem to be afraid that factor analysis drives abilities into becoming ghostly, mathematical intangibles, the mathematicians appear to be equally worried lest mathematical factors become too reified. Thomson, in particular, has protested that factors are not "entities" or "organs" and have no "real existence." Others have echoed this necessary warning but have gone further and denied them even the status of causes. Spearman has issued the modest and timely reminder that a factor is "one of the circumstances, facts or influences which produce a result," a statement beyond cavil.

Obviously "g" is no more resident in the individual than the horsepower of a car is resident in the engine. It is a concept derived from the relations between the individual and his environment. But what trait that we normally project into and assign to the individual is not? The important further condition is that the factor is not determinable by the individual and his environment but only in relation to a group and its environment. A test factor loading or an individual's factor endowment has meaning only in relation to a population and an environment. But it is difficult to see why there should be any objection to the concept of intelligence being given so abstract a habitation when economists, for example, are quite prepared to assign to such a simple, concrete notion as "price" an equally relational existence.

A more disturbing difficulty resides in the possibility that group-factors (or "primary abilities"), in contrast to the relatively biologically founded general factor, may prove to be highly dependent, for their existence and form, upon the cultural pattern. For it seems quite likely that a few of them will prove to have no

more permanent existence than our current classification of school subjects or our present-day syndromes of occupational skills. Thurstone's practice of rotating axes to give them "psychological meaning" to some extent binds him to chasing his own test vectors and to searching for clusters[4] created by his own selection of tests which are sometimes so similar as to cover only what in Spearman's way of speaking would be so narrow as to be a "specific."

All too often when the scientist peers into the hardest and most opaque surfaces of nature he sees only the reflection of his own face. Our vectors turn out to be the foci of our own interests. Whether psychometric considerations direct us to analyzing into a general factor and relatively shallow group-factors or only into large, but related, group-factors alone, it seems that we may have to decide by fiat the precise directions, by means of reference tests and populations, of these group-factors or primary abilities.

We have to conclude this phase of the survey, therefore, with the somewhat unwelcome practical suggestion that factor systems now require an act of psychological decision. The suggestion calls for the setting up of a psychometric definitions committee to inquire as to which system offers the greatest convenience to the greatest number. Its task would be to fix vectors accordingly, by means of specific reference tests and defined populations. Such an intrusion of mere arbitrament and ballot into scientific affairs may seem a confession of failure, yet in fact it is as necessary and natural at the point we have now reached as is the creation by fiat in the physical sciences of units of measurement. Only by some such step can research and practice in psychometrics be rescued from its present futility and erected on a basis permitting precise, comparable, and permanent findings. A further refinement of this theoretical position is developed in the next section.

The Construction of Adult Intelligence Tests

If the construction of adult intelligence tests were considered satisfactory only when explicitly founded on a satisfactory theory, the majority of existing adult tests would have to be abandoned. The performance tests would be rejected *in tota* because of insufficient saturation with the general factor found in intelligence tests at large. The verbal tests would be convicted of heavy weight-

[4] Not directly, by seeking the center of the cluster, but indirectly by finding the bounding hyperplane with which most test vectors have no alignment, *i.e.* by avoiding the cluster.

ing with a verbal group-factor. Some would have overlapping subtests. Many would be found unnecessarily contaminated with knowledge, special information, or skills. Let us, however, for the moment accept this crippling debility in basic theoretical constitution and proceed rather to examine less central constructional features of the existing tests.

A survey of the *Mental measurement yearbooks* (**14, 15**) shows that the most frequent comments and criticisms on the construction of adult tests concern: the length of the tests (too short or too long), the absence of language or of number subtests when the tests are intended to select candidates for linguistic or mathematical education, the insufficient provision of variety among subtests, the use of point scales or of age scales according to the predilections of the critic, the weightings of subtests or points, the subjectivity of scoring, the defectiveness of reliability or consistency measurements, the erroneous arrangement of order of difficulty of items, the use of an unsuitable vocabulary, and the setting of ambiguous or defective instructions. Let us deal with these in order.

A glance at the length of the principal tests yields the following results, in which the first figure indicates the shortest possible time for the test and the second the length of the complete form, with all allowances for instructions and administrative requirements.

Among performance tests the Kent-Shakow takes 15–30 minutes; the Ferguson, 10–40 minutes; the Alexander scale, 40–60 minutes, the Arthur scale, 35–90 minutes. Among pencil-and-paper tests we find the ACE taking 55–60 minutes; the California Mental Maturity, 45–90 minutes; the Cattell Adult, 66–75 minutes; the Detroit, 29–40 minutes; the Henmon-Nelson, 30–35 minutes; the Kuhlmann-Anderson, 40–60 minutes; the Leiter Nonverbal, 30–90 minutes; the Ontario, 20–40 minutes; the Otis Self-administering, 35–40 minutes; the Pintner, 55–65 minutes; the CAVD, untimed, may take anything from an hour to several hours; the Revised Beta, 40–75 minutes; and the Thurstone test of Primary Abilities, 153–270 minutes. The time for such individual tests as the Binet or the Wechsler naturally depends partly on the mental tempo of the examiner and subject. The median time for the most frequently used general tests is thus about 40–65 minutes.

Judging by most comments, a test of this duration is considered by many impracticably long. In the recent military personnel testing, for example, the most widespread practice uses, at least for preliminary testing, much briefer tests while the recommendation for final testing is to use such a brief battery as the Kent Information Test, the verbal items of the Wechsler-Bellevue, and the Porteus Maze.

The problem, of course, is tied up with that of reliability or of consistency, as we shall call it, since this term is more precise and less likely to be misunderstood by laymen (and by psychologists themselves!). Is it possible to cut down a test much below one hour and still get a measure of sufficient consistency—not to mention validity—to be used as a basis for decisions affecting the individual's whole career? It may well be doubted, but the question is not at present answerable, for two reasons.

First, the consistency depends rather on the number of items answered than on the time. The number of pass or fail items seems defective in some well-known tests, sometimes because the test attempts to measure so wide a range of ability that the pass or fail range is too steep and brief for any one age sample, as may happen in the Chicago Nonverbal (age 7 to adult), the Leiter Performance (age 4 to adult), or the Binet, and sometimes because the test items are individually too "large," as in the Binet (**22**, **23**). The spiral omnibus test is in this respect defective in comparison with a battery of well-defined subtests, for testing time is consumed in reading instructions and in constantly reorienting the subject's attitude to new items.

Secondly, the problems defy quantitative recommendations because, in spite of the great attention given in manuals to reported consistency coefficients (such that no test will be accepted without them), they are practically meaningless. By a suitable choice of population almost any desired consistency coefficient can be obtained. Increasing the age range, the intelligence range, the educational homogeneity of population and motivation will give impressively high correlations. Until these conditions are required to be standardized, so that a hall-marked consistency coefficient is available, the question of minimum consistency and length of test cannot be handled with precision. Further, it is apparently necessary to add, the test manuals need to indicate whether the correlation figure represents a split-half or a repeat consistency coefficient.

Of the problems listed at the beginning of this section the most centrally important and the only remaining one requiring more than a mere indication of the difficulties is that concerning the choice of subtests. Naturally the solution to the problem depends on the answer to the question of the nature of intelligence, as discussed in the last section, but there are unfortunately many attempts to solve it without reference to that question. Wechsler (**127**), after a survey of current adult tests, says: "It is surprising,

however, how many tests that form part and parcel of most scales turn out to be poor indicators of intelligence when checked against clinical experience." This is true, for example, of the Binet. Wechsler proceeds to indict "giving rhymes, checking letters, making designs, defining unusual words, repeating long series of numbers, putting together formboards."

Unfortunately one cannot report, after surveying current trends, any systematic advance in the manner of choosing subtests. Wechsler settles down to an information test, a memory span for digits, similarities, arithmetical reasoning, picture completion, block design, object assembly, and digit symbol. The information test, in spite of its seeming objectionableness, is included on the good ground that in the Army Alpha battery when "analyzed according to their correlation with various estimates of intelligence the information test, to the great surprise of many, turned out to be one of the best of the whole series." This is widely confirmed and is paralleled by Spearman's discovery that vocabulary and school information head the "g" saturation list for children in the same school system. Wechsler's inclusion of other subtests, however, such as block design and digit memory seems at odds with his own criticism above, nor can one discern any general principle in his choice of subtests.

On the basis represented by factor analysis we should get, by Thurstone's method, the subtests which Thurstone has rightly included in his primary ability battery. Similarly, on a general factor analysis, we collect a set of subtests such as will be found scattered, but not sufficiently represented, in most current test batteries.

Thorndike's CAVD, however, among a few others, stands out as being entirely composed of highly "g" saturated subtests (**54**). The researches of W. Brown,* of Brown and Stephenson (**13**), Simpson,* Bonser,* Holzinger,* Magson (**70**), Spearman (**93, 95**), Burt (**16**), Bernstein (**9**), Thorndike (**114**), Thomson (**109**), and several others working with equally high standards of population sampling and methodology agree in pointing to such tests as analogies, opposites, synonyms, deductive reasoning, sentence completion, classification, arithmetical reasoning, and comprehending directions as having repeatedly demonstrated the highest saturation with a general factor. Thomas (**105**), among others, has made out a case for these being the tests which require the most complex eductions of relations and correlates as distinct from mere reproduction, recognition, or perception.

* The results of these researches are conveniently set out in Spearman (**93**).

In view of more recent work on the verbal factor, some of these would have to be rejected as battery mates because, despite high saturation with a general factor, they share verbal ability (**119**, **96**). Suggestions for designing a test from constituents of high "g" saturation but without verbal content have been worked out by the present writer elsewhere (**25**, **27**). The selection of the most valid subtests, in the light of recent work on the extent of group-factors, is an incompleted task.

But the selection of adult test subtests runs into other special difficulties. First, as Spearman pointed out in his "principle of diminishing returns" (**93**), the saturation of almost any performance with the general factor becomes less as higher levels of general ability are reached. Subtests of a type which correlate from .6 to .8 with the general factor among children are loaded only to .3 to .5 for adults. This may be the result partly of the individual's spreading of interest and skill with age, partly of the replacement of intelligence by habit as more activities become accustomed activities. The result might at first sight be thought to be due merely to lesser difficulty, for we know that the saturation of a test depends on its relative degree of difficulty and on the attitude adopted to it, over and above its intrinsic nature (**93**). But the lower saturation does not seem to be avoidable by increasing the degree of difficulty.

From a clinical viewpoint the same decay of subtest saturation has been observed by Wechsler, when, discussing adapting children's tests for adults, he says (**126**) that "at age seven, ability to copy a diamond is a very good indication of the child's intelligence, but if we increase the complexity of this task, say by demanding the reproduction of a bisected rhomboid, we succeed in making the test more difficult but add little to its discriminative value as a test of intelligence." The same weakening of the general factor in adult measurements is evidenced by the fact that Thurstone readily discovers the general factor for children (**121**) but not for adults(**119**). The moral for adult intelligence testing of the principle of diminishing returns seems to be that a greater number of diverse subtests needs to be used than for lower mental ages. In this respect Kuhlmann's test with 35 subtests, or the revised Binet with its even greater variety, may be as good as the CAVD with only four, despite the greater validity of each of these four.

A second difficulty specific to adult test construction is the influence of speed. The most thorough factor analysis of speed and

intelligence in children's intelligence test performances fails to reveal any separate speed factor except in very special circumstances (**9**, **100**). Sutherland was able to find a residual speed factor after extracting "g" only when the problems were patently too easy for the children (**100**). On the other hand, as the discussion of the next section, on age and performance, shows, there is evidence that speed and intelligence are more separable among adults. Clinicians have also urged their distinctness, and most mental test constructors have found themselves disposed to give more generous time allowances in the adult tests or to abolish the time limit altogether, as Thorndike does in the CAVD test.

Lorge (**66**) emphatically takes the viewpoint that speed should not enter into the concept of ability and stabilizes this position by making use of the separate concepts of "power" intelligence and "speed" intelligence, implying that the former should alone be considered intelligence in adults. Kelley (**15**) seemingly adopts the same view, for he criticizes Thurstone's tests of primary abilities on the grounds that "speed is a function of each and every one . . . . This raises the reliability coefficients . . . but lowers the purity of the measures." It is suggested indirectly by certain researches that when subjects are allowed to work at their own tempo (*i.e.* not made to work at top speed volitionally), speed factors, notably the "f" factor of temperament (**23**), will be found to emerge, even with children. The will obscures natural differences of working speed.

The emergence of a speed factor with adults may thus be due to their decreasing ability or inclination to control temperamental-physiological dispositions by effort of will. Pending further research, it seems safest to regard adult tests as measuring somewhat different factor combinations under speeded and unspeeded conditions. But there is no adequate reason for valuing the unspeeded measurement as "intelligence." Indeed, the exigencies of test practice will almost certainly lead to speeded tests being given priority in personnel work if not in research.

These two sets of observation, on diminished "g" saturation of adult intellectual performances and the adult disassociation of speed from power, may be linked with an equally independent third source of evidence to create a new concept in regard to the nature of adult intelligence. The third source lies in the data on mental capacities and brain injury, principally as summarized in the contributions of Doll (**31**), Hebb (**49**, **48**), Lashley (**62**), and Weisenburg and McBride (**128**). From a review of psychometric data in this field Hebb (**48**) has attempted a generalization similar

to that of Lashley in the field of animal studies and to the effect that a localized brain lesion produces in children a generalized impairment more noticeable than any specific functional loss, whereas in adults a corresponding injury produces more specific loss of powers and less obvious loss of "g." This he considers well substantiated, but he puts forward more tentatively a further observation that the adult deteriorations are least in vocabulary, information, and verbal comprehension and greatest in speeded tasks, abstract problem-solving, and unfamiliar performances (**49**, **48**). The latter are the performances which in any case decline most with age and which suffer most in schizophrenia. The present writer would add that they are also the tests which show the best "g" saturation in adult populations.

The hypothesis in which the considerations of the last two sections culminate, in the opinion of the writer, may be set out most briefly as follows:

(1) Adult mental capacity is of two kinds, the chief characteristics of which may be best connoted by the use of the terms "fluid" and "crystallized."

(2) Fluid ability has the character of a purely general ability to discriminate and perceive relations between any fundaments, new or old. It increases until adolescence and then slowly declines. It is associated with the action of the whole cortex. It is responsible for the intercorrelations, or general factor, found among children's tests and among the speeded or adaptation-requiring tests of adults.

(3) Crystallized ability consists of discriminatory habits long established in a particular field, originally through the operation of fluid ability, but not longer requiring insightful perception for their successful operation.

(4) Intelligence tests test at all ages the combined resultants of fluid and crystallized ability, but in childhood the first is predominant whereas in adult life, owing to the recession of fluid ability, the peaks of performance are determined more by the crystallized abilities.

The goodness of fit of this hypothesis to the facts of power and speed difference in adults, to the decline of speed intelligence with age, and to the physiological data for animals and men is sufficiently clear. It fits the factor analysis data equally well. For if the crystallized abilities are, as it were, a dead coral formation revealing by its outlines the limits of growth of the original living

tissue, these crystallized abilities will show approximately the same intercorrelations as the original fluid abilities.

Actually we should expect the intercorrelations to approximate the childhood values but to be systematically lower (as indeed we find in the lower "g" saturation of adult subtests) for the following reasons:

(1) Loses of particular abilities in adult life, through injury or neglect, would leave an irremediable unevenness unknown in childhood, where the omnipresence of fluid ability determines an all-round even level of performance.

(2) Since in childhood fluid ability is constantly growing, so that its discriminatory power quickly overtakes the level of any crystallized, discriminatory powers established by exercise, it is very difficult, even with extreme application of time and effort in one direction, to develop special discriminatory habits much, or for any length of time, ahead of the general fluid ability level.

(3) Moreover, the all-round inferiorities and insecurities of childhood, as well as the general, unsystematized interests and curiosities, cause a more widely distributed investment of fluid ability in building up discriminatory habits than is found with the adult whose life adjustments are better served by continuous application in one particular field of skills, *e.g.* those involved in his occupation.

In recent years several formulations approximating to the above crystallization hypothesis have been made. Lorge (**66**) suggested a division into power and speed. Hebb (**48, 49**) has independently stated very clearly what constitutes two thirds of the present theory, for he says that "intellectual power may be needed for the first appearance of the qualitatively superior response, but not necessarily for its persistence" (**49**), and "in any test performance there are two factors involved, whose relative importance varies with the test: one factor being the lasting changes of perceptual organization and behavior induced by the first factor during the period of growth." The present theory differs from Hebb's: (1) in identifying the first factor with "g" among children, thereby modifying Spearman's "g" hypothesis to take account of findings regarding age changes and brain lesions; (2) in considering intellectual development to be a continuous increase in the capacity to perceive hierarchically more complex relations rather than an appearance of new, qualitatively superior responses; (3) in supposing, contrary to Hebb and Lashley (**62**), that the high intercorrelation of tests in childhood is due to a functional unity of fluid ability and therefore, presumably, of cerebral action and is not an artifact arising from pre-established

harmony in growth; (4) in connecting with more connotations, thereby making the theory more rigid, more remote from the level of a descriptive hypothesis, more subsumptive of data from different fields.

The hypothesis also has some kinship to Spearman's doctrine of energy and engines (**93**). It differs (1) in incorporating data not available at the time of Spearman's formulation permitting more specific and operational definition of the "engines," and (2) in considering only part of the adult statistical general factor to be due to the operation of the "energy" or general fluid ability. The remainder of the intercorrelation is explained as a reflection of the high-water mark in a variety of abilities left by the receding tide of fluid ability, *i.e.* the intercorrelations are only historically traceable to the nonspecific fluid ability.

This *hypothesis of fluid and crystallized ability*, if sustained by further discussion, would seem to be of crucial importance to the practice of adult intelligence testing, indicating the need for a dual measure if the individual's performance in different situations and at different periods is to be predicted reliably.

The next problem specific to adult testing concerns motivation and the role of test sophistication and practice. Most psychometrists are impressed with the difficulty of getting adults to do tests at all. At the very least, their motivation lacks that first fine careless rapture with which children approach competitive tests.

Miles and Miles (**76**) mention "the difficulty which we and others have encountered with adult subjects in administering tests." Weisenburg, Roe, and McBride (**129**, p. 37) report 21% of refusals among general hospital patients invited to undertake tests, but others report up to 50%. Apparently there are no experimental findings concerning test motivation effects among adults, other than those which show that with college students, as with children, strong additional incentives produce no significant increase in score (**7**, **35**, **71**). Nevertheless, Lorge's (**67**) findings on adult learning suggest that some of the peculiarities of adult intelligence test performance may result from defective interest and intention and indicate the desirability of devoting time to orienting the subjects in the practice of adult testing. Teagarden (**15**, p. 225) recommends for this purpose such a performance test as the Kent-Shakow, which seems generally to evoke natural adult interest, for, he says, "Because of the interest, the test is valuable for establishing rapport with the adult applicant, who may be a bit fearful or scornful." Such use of a performance test before the test proper is, of course, a common clinical practice with children, but it may be quite as necessary with adults.

A related problem concerns the use of "shock absorber" or practice tests prior to the main test.

The general evidence (**1**, **23**, **89**, **110**) is to the effect that practice in intelligence tests leads to appreciable gains, greatest between the first and second testings but still appreciable between the later testings. Dave (**30**) has shown that this practice effect is greater with respect to some tests, *e.g.* spatial classifications, than others, *e.g.* analogies, mixed sentences, and comprehension, but we do not yet know whether this difference arises from the average adults' comparative lack of previous experience in the first type of test situation. The present writer and co-workers have shown (**27**) that practice gives greater increments with the ACE and Binet than with a culture-free (perceptual) test or the Arthur performance scale. Vernon (**123**) has convincingly split up the general practice effect into practice as such and "test sophistication," *i.e.* general orientation to the examination situation and to the psychology of mental test constructors.

No studies offer direct or sufficient evidence as to the relative importance of practice and test sophistication among adult populations in contrast to children, but it seems likely that inequalities of test sophistication, if not of practice, would be a more serious problem among adults, for older adults are more remote from the examination situation, emotionally resistant to it, uninterested in competition, less likely to be acquainted with the latest fashions in intelligence tests, and unused to working to brief time limits. Consequently, with adults, the inclusion of a practice, "shock absorber" test before the true test (to be ignored in the final scoring) would seem to be desirable or even indispensable; but less than one in five of the above forty-four tests employ such a device.

Problems of Standardization and the Method of Expressing Measurements

The new and unexpected difficulty confronting the standardization of adult intelligence tests lies in the discovery between 1928 and 1934 by Willoughby (**131**), Miles and Miles (**76**), Jones and Conrad (**60**), Sorenson (**89**, **90**), and Cattell (**21**) that adult intelligence test scores actually decline after the age of 20 or 25 years.

Interpretations of this decline have varied, but some perspective has been arrived at through the more recent research and observation of Gilbert (**42**), Cowdry (**29**), Sorenson (**91**), Brady (**11**), Henry (**52**), and particularly of Lorge (**66**, **67**), Wechsler (**127**), Lawton (**63**, **64**), and Weisenburg, Roe, and McBride (**129**). Willoughby (**131**) found declines in completion, analogies, opposites, etc., but not in arithmetic, and con-

cluded that, since the last is more used in adult life, the declines in the more "literary" tests could be put down to distance from schooling and to the schooling of the older adults having in fact been poorer. There is, of course, ample evidence of negative correlation between adult intelligence and school-leaving grade (**52, 82**). Cattell (**21**), who found decline greater in the less skilled occupational groups, concluded the effect to be partly biological and partly due to "promotional impoverishment" of lower occupational levels. Miles (**75**) supplied the necessary proof, lacking in other studies, that the decline occurs not only as between serial age samples of the general population but in any one set of individuals tested after the lapse of years. Such results indicate that much the greater part of the decline must be assigned to an inherent process and not to educational selection, promotional impoverishment, or any other social mechanism.

The magnitude of the decline between 25 and 65 in the early studies was considerable, often in the neighborhood of one standard deviation. In the very carefully sampled study of Jones and Conrad (**60**) it was found that the more representative the sampling, the greater the decline, since the more deteriorated of the elderly people tended to avoid testing. Miles and Miles (**76**) found an age-intelligence correlation of $-.50$ over the range 20–95 years, but a lower correlation over shorter periods. They also demonstrated that the decline was smaller for the higher educational groups. The age from which decline begins was found to be, on the Army Alpha, between 19 and 21 (**60**). Miles and Miles (**76**), on the Otis, found the peak about 25, while Wechsler (**127**), with the Wechsler-Bellevue, found it at about 23. In all these inquiries the change is very slight from the first five years after the peak. The curve then settles down to a straight line from about 27 to 65, after which it falls more steeply.

Much remains to be discovered concerning the forms of mental ability which persist or decline together with age, for knowledge here would throw light on the nature of intelligence and on the necessary observances in adult mental test construction.

The work of Willoughby, and Jones and Conrad, showed, on the whole, that the most rapid decline took place in those tests generally considered among the best for measuring intelligence, *e.g.* analogies, common sense, and number series completion. General information, synonyms, opposites, and arithmetical reasoning are relatively well maintained. The fact that the age peak of performance for verbal abilities appears later than for nonverbal powers led Weisenburg, Roe, and McBride (**129**) to consider that the important distinction in age decline might be between verbal and nonverbal material, but the conditions fixing the peak of the adolescent upgrade and those governing the steepness of later decline may, of course, be quite different, in one case the

emphasis being on learning and in the other on forgetting. In their own study they found very little decline on vocabulary, reading, spelling, and arithmetic tests (**129**). This selection, as they point out, is more consistent with the hypothesis that continued use and experience suffice to determine lack of decline, though they wisely add that one must consider also "the possibility that (these tests) involve abilities which mature late or decline slowly."

Speed has so far proved the most clear-cut factor distinguishing between declining and nondeclining tests, as indicated in our general discussion on intelligence theory above.

Miles (**76**) showed by a comparison of the Otis Speeded and Unspeeded that speed declined faster than power, at least until late maturity, when the decline in power became equally apparent. It is well known that tests of sheer reaction time, sensory acuity, motor shills, and perception come to maturity earlier than reasoning powers and decline sooner, so that the partialling out of such elements from intelligence tests might conceivably leave them practically immune to age effects. Lorge's (**66**) inquiry offers the most complete data on the question. He gave 11 "intelligence" tests to 145 adults ranging from 20 to over 70 years of age. The scores with age correlations were all negative, ranging from −.275 with the CAVD (unspeeded) to −.485 with the Otis A (speeded). Lorge concludes that the "reported deterioration is more apparent than genuine" when power tests rather than speed tests are used. Correcting for speed gives a plateau or even a slight age rise in power performances, though he admits this result may be an artifact due to the death rate being higher among the less intelligent. His later work on age and learning (**67**), revealing the difficulty of getting adequate motivation in adults, raises the further possibility that part of the age decline of intelligence score in adults is due to inadequate drive, but, apart from such alternative suppositions, the conclusion that the decline of power with age can be considered negligible is distinctly questionable.

The issue of speed and power separation cannot be considered solved. As mentioned above, a number of researches have shown (**9, 73**)that it is not possible with children to extract a factor of speed as distinct from the general factor of power in intelligence tests. Even in Lorge's research, the CAVD with unlimited time correlated .85 with the speeded Otis. It is possible, however, that with adults factor analysis will give different results, justifying a conception of intelligence into which speed does not enter. Even so, it seems essential at present that adult tests, preferably with liberal time allowances, should be standardized anew for each decade. A mere age allowance, based on change of mean, is not sufficient until we know how the standard deviation varies from decade to decade. However, the Wechsler-Bellevue standardiza-

tion, which admits a 20% decline in norms between 20 and 60 years, is probably as near as we shall come for some time to a test satisfactory with respect to age change, though the research work with the Otis and Army Beta has provided sufficient data for working out an allowance on these tests also.

A more intractable problem in scoring and standardizing adult intelligence tests concerns the use of the intelligence quotient. All the accumulating criticisms of the IQ in work with children receive such added power from the special difficulties of the adult situation that a considerable proportion of psychometrists does not hesitate to condemn its use in this field. Greene justifiably observes (**43**): "Standard scores seem to be already preferred to IQ's when dealing with adults, as shown by the frequency of their use among college and employment bureau records." Yet it is easy to see that much of this condemnation is premature, a result of slavery to fashion and the obsession towards change for its own sake. When the factorial content of intelligence is settled, there should be no difficulty in discovering, with far more accuracy than we can now aspire to, the true age of cessation of intelligence growth and the consequent denominator to be used in working out adult IQ's. Adult IQ's below 100 can then be calculated in the usual way, and those above 100, by assuming that IQ's above 100 are distributed on the upper half of a normal distribution curve, or as a reflection of the distribution of the lower half or on a curve which is a replica of whatever distribution curve has been found for children. This standardization procedure has had its practicability demonstrated for at least one adult test since used for a sufficient variety of purposes in surveys, guidance, and research (**21**). To express adult intelligence in terms of IQ is admittedly artificial—as artificial as equating the power of a airplane to that of a number of horses, or expressing the brilliance of an electric light in terms of candles, but the critics' objections on this score seem somewhat ill-considered.

As alternatives to the IQ one may use a percentile score, a standard score (including such derivatives as the T-score), or one of the growth constants that some researches have suggested. Since the translation of an IQ into a percentile score or a standard score requires but a few seconds, the IQ can be considered to offer what a standard score offers plus the further significance which attaches to the ratio itself. For those who are accustomed to use intelligence tests over the ranges of childhood and youth, the IQ carries an immediate meaning in terms of relative ability, of level

of brightness, and of certain scholastic clinical and occupational reference points. It is hard to see what is gained by substituting a stark standard score for the richer connotation of the universal IQ.

If any real objection exists to the IQ, it exists among the systematic difficulties already existing in the device as a measure even of children's intelligence rather than in those peculiar to adult testing. Let us view these difficulties in the light of alternative measuring devices suggested.

Suggested substitutes for the IQ are almost as numerous as mental test designers. The last 20 years have seen the Index of Brightness by Otis, the Intelligence Ratio of the Myers Mental Scale, the Coefficient of Intelligence of Yerkes and Wood, the Absolute Mental Units of Arthur and Woodrow (**4**), the absolute scaling of Thurstone (**116**) and of Richardson and Stokes (**83**), the equal units of Thorndike (**114**), the Heinis Personal Constant (**50**), and its modification in Kuhlmann's "P.A.," or per cent of average, and so on.

Most of these modifications, of course, imply the abandonment of the idea of mental age as well as IQ. The substitution of a point scale for mental age scoring has been a growing demand among applied psychologists. A. W. Brown (**15**, p. 223), for instance, approves of the Herring-Binet Revision because "first, the Herring is a point scale which, according to most test theorists, is an advantage." But the substitution of a point scale does not mean for most psychologists any tampering with the notion of mental age as such. Their consent extends only to the method of arriving at mental age—namely, through a point scale.

Important theoretical possibilities exist in these alternative conceptions, and undoubtedly it is time for full justice to be done to them, but the present survey cannot undertake so ambitious a digression. Some of them, like the IR, combine units of age and raw score in a grotesque mongrel measurement. Others build a delicate superstructure of exact calculation on the perilous assumption that one can arbitrarily fix "equal" unit intervals of mental growth in terms of raw scores.

Richardson and Stokes (**83**) confirmed Thurstone and Ackerson's finding (**120**) that the spread of intelligence score at any age is proportional to its mean level at that age and that sigma divided by the mean gives a constant of about 0.18. Studies of growth on absolute scaling generally give a G curve.

[5] See, for example, the data of Bellis, C. J. Reaction time and chronological age, quoted by Lorge, I. (**66**, p. 109).

Heinis' notion of a growth factor (**50**), as expressed in the formula $Y = B(1 - e^{x/d})$, certainly merits further investigation; for there is no particular reason for supposing any solemn promise on the part of nature that so simple a ratio as the IQ shall be exactly constant or the one infallible index for defining the growth curve. Yet, as it is worked out at present, there is much in this growth constant that is arbitrary and unsatisfactory. For instance, the particular curve which Heinis settles upon supposes "that the growth of human intelligence does not normally stop from the time of birth to old age. This progress, while remaining positive, diminishes from year to year, so that by the age of 40 the normal man has practically attained his maturity" (**50**, p. 167). Garrett, commenting on the Kuhlmann-Anderson use of this constant, says: "Heinis units are derived values obtained from fitting an arbitrarily selected exponential equation to certain poorly prescribed data, gathered by Heinis from various sources" (**15**, p. 227).

Woodrow (**134**) has recently suggested a formula which yields a curve excellently fitting the observed development of intellectual abilities as well as many other psychological functions. But there is no suggestion that any particular constant or constants therein represents the individual's endowment.

The sole basis for real dissatisfaction with the IQ resides in some researches claiming to show a systematic inconstancy (**84**) in the direction of a decrease of low and an increase of high IQ's with time. The Heinis constant specifically sets out to avoid this.

An investigation of this issue by Psyche Cattell (**20**) reveals that, though below average IQ's undoubtedly fall, those above average remain constant. For the latter values the Heinis constant is less constant than the IQ. The author points out that the fall of IQ in defectives may be an artifact arising from their limited environments in relation to the test requirements and adds, regarding the previous findings of IQ inconsistency, that there has been unwarranted generalization, since the observations originate from only one test—the Binet. Errors of sampling in the upper age level standardizations, contamination of tests with scholastic skills, scholastic selection, simple regression to the mean, etc. obviously need to be investigated before assuming inconstancy of the IQ. Such considerations have been emphasized in a recent thorough review of IQ constancy in this journal by Robert Thorndike (**113**).

Before abandoning the IQ so precipitately, its critics might, moreover, first investigate possible modifications in its calculation. For example, should standardization be through regression of score on age or age on score? Should the zero of innate development be placed at birth or should nine months be added both to the age denominator and to mental age performances? The latter would seem to be more reasonable if intelligence is more dependent on

inherent maturation than external stimulation. Should the IQ be based on a measure of the pure vector rather than on a sum of subtests containing an unknown bonus of special abilities? And so on. Apropos of the possible significance of contaminating a measurement with unintended specifics, Thomson comments on Thurstone's Test of Primary Mental Abilities (**15**, p. 260): "My first reaction, however, was one of great disappointment that Thurstone, after all the spade work he has done towards measuring these primary abilities as accurately as possible, should have descended to the crude plan of offering the sum of the raw scores in a couple of tests as the measure of each factor." But this is done every day by those who impute the inconsistency of the resulting IQ to the psychological or biological spuriousness of the IQ itself rather than to the variable specifics and errors they have included in their contaminated measurement. Until growth curves for general abilities and primary abilities are better understood, no advance in precision on the IQ seems to be obtainable by shifting to other "constants."

The notion that the IQ contains everything in a standard score and more besides is potentially true, but is it not entirely a valid and practical argument at the present moment, for the standard deviation of the IQ has in fact not yet been fixed to the satisfaction of all psychologists.

The early Binet testing seemed to approach an S.D. of about 11 points of IQ (**16**). Terman's first extensive California studies (**102**) indicated that it lies near 13 points. More recent work with children (**103**) and, less extensively, with adults suggests its stabilization at 15 or 16 (**104**). The ideally complete Scottish survey (**136**), however, showed a standard deviation of 16 to 17 points, and some Binet surveys have given 19 points. On turning to group tests, larger standard deviations are obtained. The present writer, finding S.D.'s of 25 and 27 (**21**, **24**), has argued (**23**) that since the scatter is greater with the more recent tests, freer from scholastic influence (which forces the dull and slows the bright), the true S.D. of IQ's is probably significantly higher than that which we now accept. Thomson concedes that this view is possibly right (**15**, p. 210) and adds that the experience of Moray House in adult testing with newer group tests indicates that the scatter of the obtained IQ's needs to be reduced by about a third in order to produce values comparable with the measures of the Binet test, which has a diminutive scatter. Some recent unpublished findings by Stephenson at Oxford, working with perceptual tests free from verbal factor loadings, concur in indicating a far greater adult variability than had previously been supposed and would support the above argument that the scatter on less educationally biased general ability tests will be found larger than that now accepted as normal.

These uncertainties regarding the rate of exchange between IQ and standard score are admittedly an argument against the present use of the IQ for adults. A few years of research, however, should suffice to establish the relation. To go off the IQ standard, therefore, at the present juncture, for this reason, would seem quixotic as far as theory is concerned and wasteful with respect to the accumulation of useful knowledge.

From a survey of these and other practical and administrative testing problems one is forced again to the conclusion set out in the early part of this article: that the most intensive research on applied psychometrics or on restricted theoretical issues is vain so long as the central question of the nature of intelligence and human abilities is neglected and unsolved, and that adult intelligence testing in particular requires for its successful prosecution the solution of this problem.

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THE STANDARDIZATION OF THE TERMAN-MERRILL REVISION OF THE STANFORD-BINET SCALE

A Special Review

BY HENRY E. GARRETT
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McNemar, Quinn. The revision of the Stanford-Binet scale: an analysis of the standardization data. Boston: Houghton Mifflin, 1942. Pp. 185.

This is a companion and supplementary volume to Terman and Merrill's *Measuring Intelligence*. Essentially, it is a presentation, summary, and analysis of the data upon the basis of which the 1937 revision of the Stanford-Binet scale was constructed and standardized. Except for Chapter I, the book was written entirely by McNemar, who is certainly to be commended for the compact and succinct form in which the material is presented. A minimum of long-winded discussion and speculation makes the book much easier to read than one might have anticipated.

The first chapter (contributed by Terman) summarizes briefly the new revision procedures, describes the subjects, methods of test placement, characteristics of age-scales in general, and other pertinent facts about the test. Chapter II shows the distribution of IQs from Forms L and M to be essentially normal over the different age groupings. Mean IQs run 3–6 points above 100. This is as it should be, according to McNemar, since the standardization group did not adequately represent the lower occupational levels or rural groups. When corrected for these factors, the mean IQ by age levels will be close to 100. The SDs for Forms L and M are close to 17 IQ-points. This means that the spread in the New Revision is considerably greater than in the Old (in which the SD was approximately 12 IQ-points), and hence IQs from the two scales are not directly comparable.

Chapter III presents an analysis of IQ distributions by age and by grade. Several interesting facts appear in the tables which give the variabilities of MA and IQ by age and by grade. The SDs of the IQs remain approximately equal at successive age-levels,

while the SDs of the MAs show a fair—but not entirely regular—increase with age. These two necessary conditions for IQ constancy are, therefore, reasonably well fulfilled. Age and grade groups are about equally variable in IQ. But the range of MAs within any given grade is astonishingly large. One finds the MA range in the 6th grade, for instance, to be more than 6 years, and the range is even greater in grades 7–12.

In Chapter IV the main sample is broken down into occupational levels and into urban and rural groupings; and the mean IQ and variability of each group are given. Children whose fathers are in the professional group average 18–20 points higher in IQ than children whose fathers are in groups IV, V, and VI (rural owners, semi-skilled, slightly skilled) and this difference holds at all age levels. McNemar very wisely refuses to commit himself either to an all-out genetic or environmental explanation of these considerable differences. But at least one author (Neff, W. S., Socio-economic status and intelligence: a critical survey, *Psychol. Bull.* 1938, **35**, 727–757) has been willing to interpret IQ differences between occupational levels as due mainly, if not entirely, to environment. To the reviewer the fact that (1) the mean superiority in IQ in the higher occupational group holds at *all* age levels, and (2) the further fact that IQ variability is as great at the lowest as at the highest occupational levels (suggesting that environment did not exert a *generally* raising or lowering effect) argues as well for a basic genetic determination. Further argument on the same point might run something like this. Let 20 points of IQ represent the maximum effect of environment (mean difference between occupational levels I and VII). Now the maximum effect of environment plus all other factors can hardly exceed 90–100 IQ points, since this is the total range at a given age. If 20% of this range is assigned to environment, roughly 80% of the variability in IQ among children of the same age may be ascribed to biological factors plus other non-environmental effects (e.g., chance errors and the like). This conclusion is speculative, to be sure, but it is in rather close agreement with other analyses (Burks, Woodworth).

Chapter V finds little evidence of sex differences either in MA or in the separate items of the test. In a very general way, girls tend to surpass boys at the lower age levels, and are better on certain manipulative tests (buttoning, knot tying); boys surpass girls at the upper age levels and on tests of space perception,

arithmetic, and puzzle-like tests. But the tests showing sex differences are few relative to the scale as a whole.

Data on the reliability (Chapter VI) of the New Revision are much more completely presented than was true of the Old Revision. Instead of a single standard error of an obtained IQ, McNemar has by the use of two methods (which check closely) determined standard errors for different IQ levels. The s.e. for IQs of 130+, for instance, of 5.2 is to be constrasted with the s.e. of 2.2 for IQs below 70 IQ. This finding, namely, that low IQs are more stable than high is not only statistically valid, but is in agreement with the experience of clinical workers. While the s.e. of an IQ is not large in view of the difficulties inherent in mental measurement, one can expect variations of as much as ± 15 points in IQ determinations of a bright child—due entirely to errors of measurement. For this reason, in part, much misunderstanding might be avoided if psychologists would describe a child by such phrases as "bright," "dull," and the like, instead of labelling him with an IQ of 82 or 112. Numerical scores convey an unwarranted impression of exactitude, and even small changes in them provoke criticism and misunderstanding.

Chapters VII and VIII deal, respectively, with the problem of scatter in IQ distributions and with percents passing the test items by age levels. Spread or scatter was found to be in part a function of recurring scale items, *i.e.*, of sub-tests placed at more than one age level. Scatter is not a consistent function of the individual and is not related to general IQ level. Tables give in full the percents passing the items by age groups. These data show a much higher percent passing at lower than at upper age levels. For example, 72% (on the average) of 4 year olds pass the items assigned to Year IV, while 60% of 10 year olds pass the items at Year X. Various psychometricians, as our author notes, have held that an item is correctly placed when assigned to that age level at which just 50% of the subjects pass it; and mathematically this would seem to be reasonable. McNemar, however, vigorously condemns reliance upon the 50% criterion. He lists three "considerations" (p. 87) to explain why higher percents are necessary in the New Revision. These are (1) "the fact that it is simply impossible otherwise to construct an age scale of the Binet type that will yield mean mental ages equal to mean chronological ages"; (2) "the fact that the location and grouping of items at a given level is mainly one of convenience which facilitates testing

and scoring"; . . . and (3) "the fact that the individuals of any age group encounter items which are actually of 50% difficulty for their age group even though the items placed at their own age levels may be less difficult." It is not immediately obvious that either (2) or (3) of these considerations is directly relevant to the issue of test placement, while (1) is simply a flat pronouncement of what scale standardization may have shown to be true without showing why this is true.

Terman's explanation of the allocation of tests in the Old Revision is much more clarifying (*Stanford revision of the Simon-Binet scale*, 1917, pp. 154–155) than is the present discussion. The rapid rise of the age-progress curve in the early years and the resulting drastic changes in percents passing, plus the increase in spread at the later ages, are apparently the crux of the matter. From the data in Table 26 (pp. 89–98), one may readily demonstrate to his own satisfaction that a typical 4 year old and a typical 12 year old will test approximately "at age" on the New Revision. Essentially the allocation of test items to specific age levels boils down to a cut-and-fit process. The authors could have saved themselves much space by saying so at the outset.

A persistent problem which plagues the constructor of a general intelligence scale like the New Revision is that of whether the test is measuring a "unitary" ability; and if it is whether this ability remains constant over a wide age range. In Chapter IX, McNemar attacks this problem for the New Revision using the methods of factor analysis. Intercorrelations were calculated between the separate items from four-fold tables. Fourteen separate factor analyses were then made (using Thurstone's centroid method), the test items being so dove-tailed as to provide a series of overlaps; *e.g.*, the items of years 7 and 8 were combined in one analysis and the items of years 8, 9, and 10 in another analysis. Several facts stand out clearly in these tables, which may be summarized as follows. First, a strong first factor is conspicuous in all 14 tables. This factor accounts for the intercorrelations of the items and for from 35–50% of the variance of the battery. A study of overlap provides good evidence that the first factor weights are estimates of an ability which is consistent throughout the scale. McNemar points out that *some* generality is to be expected in the New Revision because the items were so chosen as to be correlated. And that the size of the first factor loadings are definitely limited by the low reliabilities of the separate items

(estimated to be around .65). Secondly, a second and perhaps a third independent factor may be present at the very early and at the later age levels. Rotation of the centroid axes gives a suggestion of additional factors, probably involving verbal and motor abilities at ages 2–2½; and of verbal and numerical group factors at age 5. But McNemar stresses the dubious nature of these additional factors. Thirdly, belief in the existence of a broad intellective factor which runs through the New Revision is strengthened by the factor analyses. Test items having high loadings in this factor require, in general, ability to solve problems involving words, numbers, spatial concepts. Test items having low factor loadings are more concrete and manipulative and present tasks demanding somewhat routine activities. The fact that such a diversity of test items can be assembled to yield a general factor—even when carefully chosen so to do—is strong evidence (it seems to the reviewer) for the existence of such a general factor in mental activity as Spearman has long urged.

Chapter X presents three scales each made up of items selected from the New Revision. The first, a vocabulary scale, should prove useful as a quick estimate of general intelligence for the ages 8 to 18. Its correlations with Stanford-Binet MA are .71, .83, .86, and .83 for ages 8, 11, 14, and 18. The second scale is non-verbal. There are two forms of this test each containing one-half of the 40 items judged to be the least verbal in Forms L and M. These scales are less highly saturated with the general factor than are the other items in Forms L and M. They correlate around .65 with MA. A memory test, consisting of two forms each of 22 items makes up the third scale. Correlations of this test with MA show these items to be measuring much the same ability as the scale as a whole. This is not surprising in view of the evidence that memory and general intelligence (as measured by the Binet type of test) are not different functions at low age levels. Memory does appear to be a function distinct from intelligence at later ages and is certainly so at the college level.

The first ten chapters of this book are concerned primarily with the standardization data of the New Revision. In Chapter XI (*Units of Measurement*), McNemar drops the role of expositor to express positive opinions upon several of the persistent problems which confront the test-maker. McNemar considers first the question of whether standard scores furnish units which are somehow more fundamental and more "truly equal" than are original

scores. A standard score, he writes (p. 158), is simply a linear transformation of raw scores into SD-units; such a transformation (he points out) does not change the form of the distribution nor equalize the units of the test. This is entirely true, but is not directly relevant to the problem of scaling test scores into "truly equal units" (the phrase is Thorndike's). I cannot agree with McNemar that there are "a surprisingly large number of psychologists 'who claim' that the use of the standard-score method will yield units which are equal or 'truly equal' (p. 157)." When the normal curve hypothesis is tenable (or distributions are of the same form), standard scores are convenient devices for comparing or combining tests scored in different or in incommensurable units. Thus, on the assumption of normality of distribution, a ten year old boy who is 1 SD above the mean of his age group for height, and 1 SD above the mean of his age in weight is, in a real sense, as heavy as he is tall. But the transformation of obtained scores into standard-scores makes no assumption in itself of normality, nor does such transformation lead to units which are any more nearly equal than are the raw score units.

I think that McNemar has confused standard-scores with T-scores,—at least so far as equal unit scaling is concerned. T-scaling converts the percents achieving each score into equivalent SD-positions along the baseline of the normal curve. No assumption is made regarding the distribution of raw scores, but the true distribution of ability measured by the test is assumed to be normal. The distribution of calculated T-scores will have the same form as that of the original scores; only in the ideal normal distribution assumed for the trait are the T-scores normally distributed. SD-units along the baseline of the normal curve (upon which our T-scores will fall at irregular intervals) are mathematically equal or in Thorndike's words "truly equal."

The point should be stressed, perhaps, that the units on *any* scale are equal *only* with respect to certain defined criteria. Psychologists have done too much breast-beating over the great advantage possessed by the physicist in having scales with equal units and a true zero. To be sure, the much-vaunted "cgs" scale does possess many advantages, among them that of having equal units; but these units are equal with respect to certain criteria,—not all. The Weber-Fechner Law has shown that an inch added to a man's nose is not *perceptually* the same as an inch added to his height, and the same number of pounds or of seconds is often

psychologically quite unequal. The same situation holds even more truly of other physical scales. The thermometer measures temperature changes by the height of a column of mercury. Divisions on the scale are physically equal. But these equal scale units reflect equal temperature changes in a specific rather than in a general sense. The amount of expansion or contraction of a physical body can perhaps be predicted from a knowledge of thermometer reading changes. But it is doubtful whether such changes represent equally well perceived differences in the resistance properties of a body, tensile strength, or in the human organism. McNemar (p. 159) in his example showing that pounds are unequal to T-scale units exhibits clearly the confusion which arises when systems of measurement are compared which are set up on different criteria and are not directly commensurable. The scaled scores of the psychologist are "truly equal" with respect to a defined criterion of performance on the assumption of normality in the trait. That such scales are useful and efficient experience has amply shown.

Closely related to his discussion of equal units is McNemar's criticism of Thorndike's demonstration that intellect in man is normally distributed. McNemar contends that since Thorndike scaled his tests into equal units by means of the normal curve, it is not surprising that distributions expressed in these derived units should turn out to be normal. He writes: (p. 17) "Thorndike has only demonstrated the obvious; a normal curve can be produced by assuming it in advance." It may be noted that Terman has also made essentially the same criticism (*Measuring Intelligence*, p. 25): he calls it "lifting oneself over the fence by one's bootstraps."

This criticism, I feel, is not only superficial and incorrect, but coming from such sources is liable to do real harm. It may be pointed out, in the first instance, that Thorndike fully understood the "circularity" objection advanced by McNemar. In Chapters II, VIII, and Appendix III of his *Measurement of Intelligence* (1927), he states explicitly that a normal distribution of test scores might arise in lieu of other causes from (1) the fact that the test was constructed with the normal hypothesis definitely in mind; and (2) from chance errors, the scores of all subjects being the same. To meet the first difficulty, Thorndike employed two procedures. First, he scaled the score distributions for several well known tests (Otis, Alpha, National, are examples) into "truly equal" units by means of the normal curve. The normal distribu-

tion was selected for scaling (others were considered, see Chapter II) because the distributions of scores in the school grades employed as standardization groups were bell-shaped and not noticeably skewed. Distributions of scores, expressed in terms of corrected units, were then demonstrated to be normal for new and different groups taken at various age levels. It is important to note that the scaling procedures corrected the units of the test (lengthened or compressed them) but did not *force* the new distributions into the normal form. As a second procedure, Thorndike showed that a test scored in truly equal units derived from Grade VI will return a normal distribution for Grade IX. He argues that while a test-maker might conceivably select his items so as to return a normal distribution for a given group, it is too much to expect him to repeat for other and quite different groups. To meet the second difficulty, Thorndike averaged four to five repetitions of the same test before scaling, on the hypothesis that the mean of several determinations would be largely free from chance error.

One may offer valid objections to certain details of Thorndike's procedure. I am not entirely convinced that he has really demonstrated intellect to be distributed in strictly normal fashion, and I agree with McNemar that his use of the Chi-Square test is dubious. But I feel sure that Thorndike has shown intellect in man (as measured by standard tests) to be essentially symmetrical and bell-shaped, and at least to be approximately normal. And this demonstration is not invalidated by the rather shallow charge of circularity.

In summarizing the material in this monograph, I should like to express the opinion that the New Revision is the most useful and is certainly the best constructed instrument for measuring the intelligence of children which we now possess. It represents an achievement of first rank; and one of which all psychologists, no matter what their persuasion, may well be proud.

PSYCHOLOGY AND THE WAR

Edited by

STEUART HENDERSON BRITT

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CLEVELAND COMMITTEE FOR DEFENSE

PERSONNEL RESEARCH IN THE ARMY
II. THE CLASSIFICATION SYSTEM AND THE PLACE OF TESTING

BY STAFF, PERSONNEL RESEARCH SECTION, CLASSIFICATION AND REPLACEMENT BRANCH, THE ADJUTANT GENERAL'S OFFICE

A previous article (1) surveyed the organization, staff, and field of responsibility of the Personnel Research Section of the Classification and Replacement Branch, The Adjutant General's Office, War Department. This is the agency charged with the construction of tests used in Army general classification and special selection, and with the preparation of various other psychological tools used in Army personnel work.

The present article will consist of a brief résumé of the Army classification system, the part which psychological testing plays in it, and a list of tests already developed by the Personnel Research Section. The intention here is to provide a general picture of the Section's work; detailed reports on the construction and use of individual tests or on other current classification projects will be published by the Section from time to time.

Classification is a complex and continuing process, coextensive with a man's entire military career. The devices and aids which the Personnel Research Section develops are employed by the officers and enlisted men of the Army's personnel system in classifying and assigning the individual soldier from the time of induction until he leaves the Service, possibly as a commissioned officer. A man may advance in grade or revert to a less responsible job after failure to measure up; careful record is kept of each significant change in status or duty. The accompanying flow chart (Fig. 1) indicates the major steps in Army classification.

The officers who administer the program in the field are, almost without exception, trained personnel technicians who have in addition attended courses in Army classification taught since 1941 at The Adjutant General's School at Fort Washington, Maryland. They must be able to direct administration and scoring of tests, and to interpret test results. These officers are chosen from men who enter the Army with a background of training and experience,

in psychology or personnel practices. The enlisted men who assist them are detailed to this work because of some training, experience, or interest in personnel problems. The work of the classification officers and men is supplemented by and checked with the judgments of line officers, who are asked to rate the men assigned to their command on the basis of actual performance of military

FLOW CHART—ARMY CLASSIFICATION SYSTEM

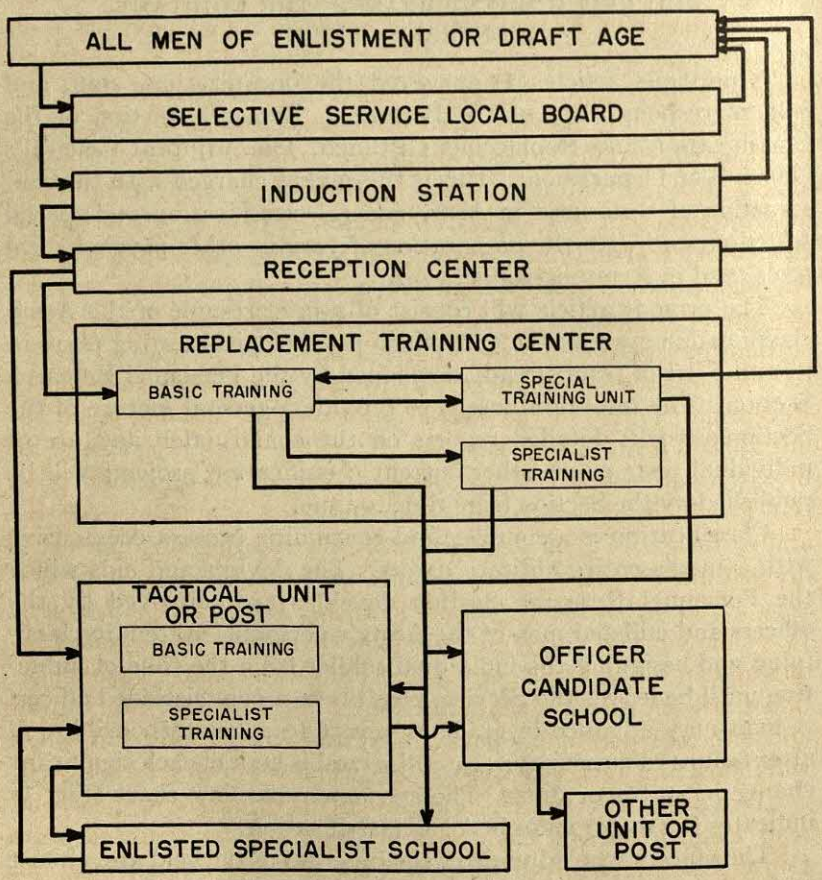

FIGURE 1

This chart is intended to illustrate only the major agencies and organizations through which a man may pass or to which he may be assigned in the process of Army classification. Military necessity, local conditions, or special requirements of some arms or services make it impossible to show more than the usual stages involved.

duties. Every effort is made to see that all measures of a man's qualifications are taken in a fair and objective manner.

The important early steps in classification occur at the Induction Station, the Reception Center, and the Replacement Training Center. At the Induction Station, before the registrant or recruit actually becomes an enlisted man, he will, if his literacy is in doubt, be given a self-administering minimum literacy test. This very simple test is intended to discover those men unable to read or write at fourth grade level, and who would therefore have difficulty in absorbing Army training, a large part of which is based on manuals and other written material. Men failing the minimum literacy test are given a Visual Classification Test which serves to indicate to the examiners those men who, although illiterate or non-English reading and speaking, are sufficiently high in native ability to learn military duties. Some of these men, if inducted, may later be sent to special training units where they will receive elementary instruction in reading and writing. According to present regulations, no more than ten percent of the white and ten percent of the colored men inducted in a single day at any one station may be illiterates.

The enlisted man is next sent to one of the more than thirty Reception Centers in the United States, where the major part of initial classification is accomplished. At the Reception Center all literate men are given the Army General Classification Test (GCT) which yields a rough estimate of the individual's relative ability to learn. The standard score distribution on this test is divided into five Army grades indicative of learning capacity: I—very rapid learners, II—rapid learners, III—average learners, IV—slow learners, and V—very slow learners. The number indicating an individual's grade is entered on the Soldier's Qualification Card which will eventually contain all essential information about the enlisted man's background and Army career and which will follow him and be kept up to date wherever he may be assigned.

Two other tests are given at present to all men who speak and read English, during their several day's stay at the Reception Center: the Mechanical Aptitude Test and the Radio Telegraph Operator Aptitude Test. These two tests assist in the selection of men who may profit most from specialist training in mechanics or in radio-telegraphy, vital fields in which the Army cannot expect to enlist enough men already trained or experienced. Scores for these tests are entered, along with that for the General Classification Test, on the Soldier's Qualification Card.

Perhaps the most important single step in Army classification is the interview at the Reception Center, in which a trained Army interviewer obtains the information required on the Qualification Card on the basis of an informal discussion with each enlisted man. These data include such items as education, languages, main and second best occupations, job history, hobbies, leadership experience, and previous military training. The test scores, already recorded on the Card, may assist the interviewer in assessing a man's qualifications; they will also assist the classification officer who uses the Card later as the basis for making an initial assignment.

If the man possesses skills immediately useful, or if he is needed at once to fill a division, he may be sent directly to a unit where basic training will be given along with training for a particular Army job. Other men, about fifty percent at present, are sent to a Replacement Training Center of one of the branches of the Service, such as Engineers, Infantry, or Signal Corps. At these Replacement Training Centers the enlisted man receives basic training and learns the duties he needs to know in order for him to take his place in the ranks of that particular branch.

If the officers in charge of classification at the Replacement Training Center have reason to believe that the low score made by a man on the GCT was due to language difficulty and does not fairly represent his ability, he may be given a non-language test in which a minimum of language skills is involved, instructions being given in standardized pantomime. Scores for this test are converted to Army grades exactly as are those for the GCT.

Throughout his service, the soldier will be rated or selected for special duties by the classification officers and line officers of the units to which he may be attached. Many men must be chosen on the basis of test scores, background, or performance to attend enlisted specialist schools where technical training is given in skilled Army occupations. Others, whose test scores indicate high intelligence and who demonstrate their ability to lead, will be sent to Officer Candidate Schools from which they will graduate as commissioned officers. Still other men who fail to learn their duties readily because of mental inadequacy, emotional instability, or similar reasons, may be sent to the Special Training Units where various types of elementary instruction will help them adapt to the Service. Some will be found altogether unfit and will be sent back to civilian life. The conditions under which the tests are admin-

istered limit the types which are useful in military classification. In general, Army tests must be objective, specific, suitable for group administration, and relatively simple to score and interpret.

Nearly all tests which the Section has developed may be scored either by hand or by machine; raw scores are usually convertible to standard scores (based on a mean of 100 and a standard deviation of 20) and to Army grades.

A list of tests developed to date is appended, together with brief comments on several of the more important and typical examples. Also included is a chart (Fig. 2) which shows customary procedures in construction.

TESTS DEVELOPED

Classification Tests

- General Classification Test
- Non-Language Test
- Visual Classification Test
- Higher Examination
- Officer Candidate Test
- Women's Classification Test (Mental Alertness Test)
- Army Information Sheet (Minimum Literacy Test)

Aptitude Tests

- Mechanical Aptitude Test
- Clerical Aptitude Test
- Radiotelegraph Operator Aptitude Test
- Code Learning Test
- Battery of Tests for Combat Intelligence
  - Identification of Aerial Photographs
  - Map Identification
  - Route Tracing
  - Battle Maps
  - Perception of Detail
  - Map Reading
  - Map Orientation

Educational Achievement Examinations

- Algebra
- Arithmetic
- English Grammar and Composition
- French
- General History
- German
- Inorganic Chemistry
- Physics
- Plane and Solid Geometry

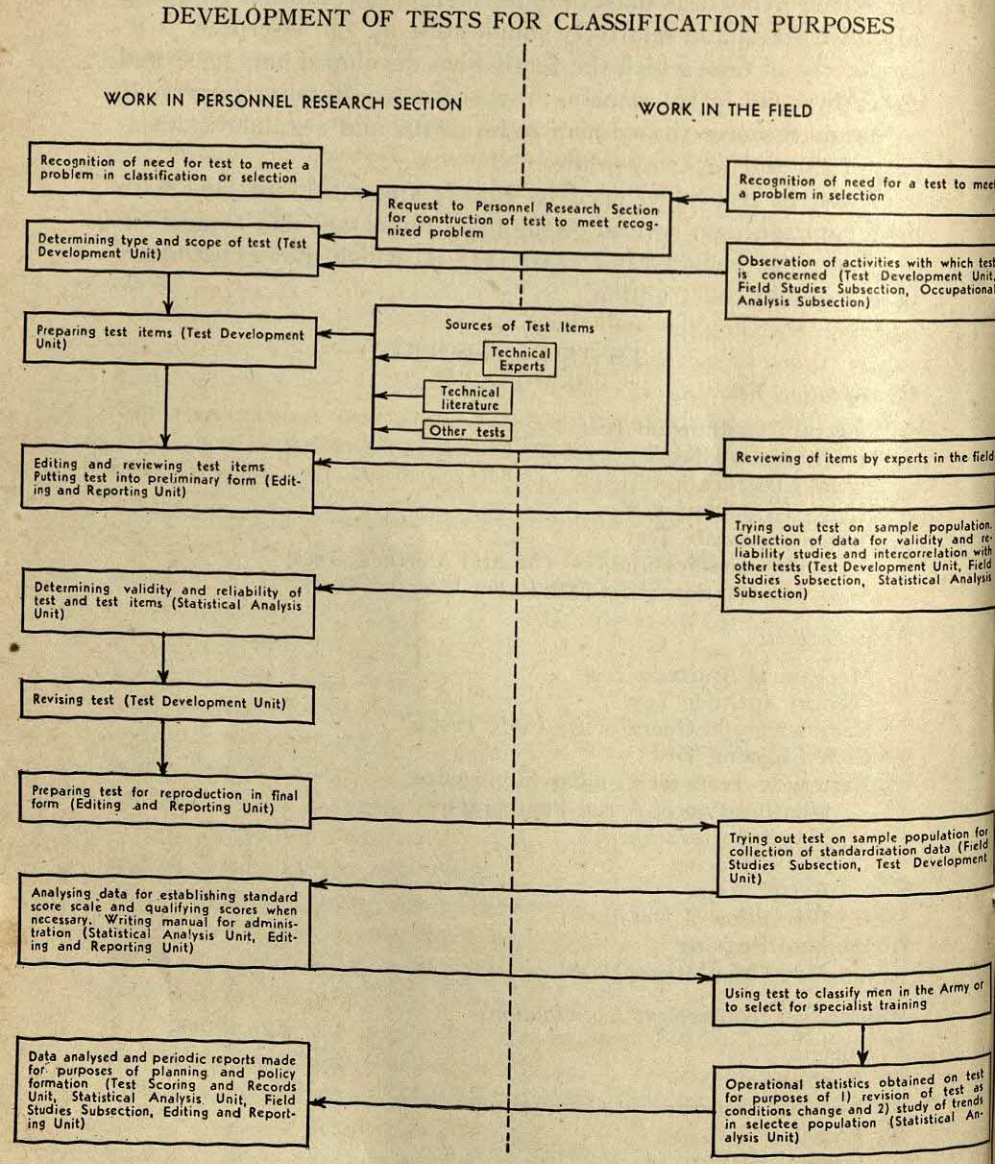
DEVELOPMENT OF TESTS FOR CLASSIFICATION PURPOSES
WORK IN PERSONNEL RESEARCH SECTION
WORK IN THE FIELD
Recognition of need for test to meet a problem in classification or selection
Request to Personnel Research Section for construction of test to meet recognized problem
Recognition of need for a test to meet a problem in selection
Determining type and scope of test (Test Development Unit)
Observation of activities with which test is concerned (Test Development Unit, Field Studies Subsection, Occupational Analysis Subsection)
Preparing test items (Test Development Unit)
Sources of Test Items
Technical Experts
Technical literature
Other tests
Editing and reviewing test items. Putting test into preliminary form (Editing and Reporting Unit)
Reviewing of items by experts in the field
Trying out test on sample population. Collection of data for validity and reliability studies and intercorrelation with other tests (Test Development Unit, Field Studies Subsection, Statistical Analysis Subsection)
Determining validity and reliability of test and test items (Statistical Analysis Unit)
Revising test (Test Development Unit)
Preparing test for reproduction in final form (Editing and Reporting Unit)
Trying out test on sample population for collection of standardization data (Field Studies Subsection, Test Development Unit)
Analysing data for establishing standard score scale and qualifying scores when necessary. Writing manual for administration (Statistical Analysis Unit, Editing and Reporting Unit)
Using test to classify men in the Army or to select for specialist training
Data analysed and periodic reports made for purposes of planning and policy formation (Test Scoring and Records Unit, Statistical Analysis Unit, Field Studies Subsection, Editing and Reporting Unit)
Operational statistics obtained on test for purposes of 1) revision of test as conditions change and 2) study of trends in selectee population (Statistical Analysis Unit)

FIGURE 2

Spanish
Trigonometry
United States History
Combined Algebra, Trigonometry, and Geometry

Trade Knowledge Tests

General Automotive Information Test
General Electricity and Radio Information Test
General Electrical Information Test
General Radio Information Test
Driver and Automotive Information Test

Warrant Officer Examinations

About 30 technical examinations

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UTILIZATION OF CLINICAL PSYCHOLOGISTS IN THE GENERAL HOSPITALS OF THE ARMY

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Previous articles by Bingham (1), Britt (2), Flanagan (4), Jenkins (5), Louttit (6), Pratt (8), Seidenfeld (9), Wolfle (10), and others, have presented information relating to the war effort and the uses to which psychologists are being put. More recently several clinical psychologists were commissioned through the Surgeon General's Office, United States Army, for service in the neuropsychiatric sections in certain of the General Hospitals.

The names and qualifications of those selected were obtained from the National Roster of Scientific and Specialized Personnel some time during 1941. At that time the Office of Psychological Personnel had not yet been established, but contacts were made with this office after it came into being, shortly before the commissions were granted. Correspondence with those on the original list was initiated through Lt. Colonel P. S. Madigan of the Surgeon General's Office during the spring of 1942. Six psychologists were commissioned in the early summer as First Lieutenants in the Sanitary Corps, the unit of the Medical Corps which comprises chiefly the non-medical specialists in the Medical Department. The following are those commissioned:

M. Dunn, Darnall General Hospital, Danville, Kentucky
R. M. Hughes, Lawson General Hospital, Atlanta, Georgia
J. W. Layman, Walter Reed General Hospital, Washington, D. C.
W. C. Murphy, Letterman General Hospital, San Francisco, California
L. I. O'Kelly, Fitzsimmons General Hospital, Denver, Colorado
L. G. Tennies, Brooke General Hospital, Fort Sam Houston, Texas

The Surgeon General's Office did not specifically define the nature of the assignments to those commissioned. Instead the appointments appear to be an experimental attempt to determine whether or not clinical psychologists can be utilized in the Neuropsychiatric Sections, and if so in what ways. This has permitted the medical officer in charge of the Neuropsychiatric Section to regulate and define the duties. It also has permitted each of the psychologists to seek his own level within the limitations imposed

by his particular training, experience, and other qualifications. That this was a wise decision is attested by reports from the psychologists commissioned. Although the nature of the duties assigned varies somewhat, all report a favorable reception. As yet there has been no official evaluation of their contributions and services.

To understand the work duties, it is necessary to discuss briefly the general function of the Medical Corps, especially the Neuropsychiatric Service. At the point of induction or enlistment, the Medical Corps shares with other units the responsibility of selecting those most fitted for military service. These requirements, in general terms, are expressed as follows (3):

> The army is one of the elements of national defense and its present mission is one of preparation for an offensive-defensive type of warfare. It is in no sense a social service or a curative agency. It is to be considered neither a haven of rest for the wanderer or shiftless nor a corrective school for the misfits, the ne'er-do-wells, the feebleminded or the chronic offender. Furthermore, it is neither a gymnasium for the training and development of the undernourished or undeveloped, nor is it a psychiatric clinic for the proper adjustment to adulthood emotional development. Therefore, there is no place within the army for the physical or mental weakling, the potential or prepsychotic or the behavior problem. If an individual is a behavior problem in the civilian community he will (almost)* certainly become a more intensified problem in the army.

Despite rigorous efforts at prevention, it is inevitable that some persons with the above mentioned physical, personality, or behavior deviations do get past the preliminary screening processes. Also, such casualties do develop as incidental to the service. With reference to the psychoneurotic and psychotic cases, Porter, Novak, and Lemkau (7) point out that "recruits are constantly under the supervision of experienced non-commissioned officers who are adept at picking out men showing any deviation from normal." Whether these casualties develop as incidental to the service or are recognized after induction as a result of the aforementioned close supervision, the Army has made provisions for their study, treatment, and disposition along prescribed channels.

Along with other responsibilities, it is the task of the Neuropsychiatric Section to look after those cases which demonstrate psychoneurotic or psychotic reactions. While other administrative arrangements exist with reference to disposition and treatment of

* The word "almost" is the writer's. It is added since there is some evidence that certain deviants can and are adjusting to military demands.

the psychopath, in actual practice they frequently are referred to the Neuropsychiatric Section. Regardless of the terminal diagnosis of the cases referred, a longitudinal and cross-section study is made of each. As aids to the longitudinal studies, case histories secured and prepared by competent social agencies and reports from the soldier's unit commander are obtained. The reliability of this aspect of the study is furthered by careful observation of the soldier's adjustment to ward routines as well as his reactions and relations to his fellow patients. The cross sectional study consists of frequent interviews in an effort to understand the dynamic factors which contributed to and now operate to effect the behavior observed. As can be seen, then, the Neuropsychiatric Section is responsible for the determination of whether or not some form of mental, emotional, or other abnormality exists in the patients. Cases referred can in general be said to include all the syndromes classified under the various forms of psychoneuroses and psychoses and other types of maladjustment. As already indicated, the psychopathic personalities need not necessarily come under the purview of the psychiatrist. This is true also of those sufficiently feebleminded as not to be adaptable to the military service. They must be disposed of under the provisions and regulations which govern them, when referred to the Neuropsychiatric Section.

There are certain other duties to which any commissioned officer of appropriate rank might be assigned regardless of his professional background. These duties are chiefly of an administrative nature, and include taking turn as administrative officer-of-the-day, and serving as a member of various boards and courts. As would be expected, each of the psychologists commissioned has been assigned to one or more of the administrative details to which he is eligible as an officer.

Analysis of the reports received from those commissioned shows that they have been responsible for the administration of various tests to cases referred from the Neuropsychiatric Section and from other wards of the hospital. This responsibility in itself represents a forward step in that it has placed the test administration into more competent hands; testing previously done had been handled by persons without particular training in this field. In addition, it has been possible to add tests which had not been used previously and which were more appropriate to problems raised by particular diagnostic problems. Thus, the Wechsler-Bellevue (Army revision), Arthur performance, Babcock-Levy test of men-

tal functioning, Rorschach, and others, are being used where indicated.

Beyond the common function of psychometrics, professional duties tend to vary considerably and include such activities as liaison with Red Cross case workers in securing social histories, assistance with electroencephalographic studies of certain cases, classification of officer personnel, examination of mental status of patients, supervision of occupational and recreational therapy, and preparation of case summaries for staff diagnosis.

The time spent in these various activities varies considerably. One psychologist officer indicates that he spends approximately one-half of his time on psychometrics and the other half on various administrative duties. Another states that about seventy-five percent of his time is occupied in the Neuropsychiatric Section (psychometric testing and diagnostic studies of mentally deficient, psychoneurotic, and psychopathic cases) and the remainder in classification of officer personnel. One psychologist who reported for duty several months later than the others indicates that he is still in the process of orientation and that his duties are not too well defined except for the psychometric responsibility. Still another, aside from his administrative assignments, gives most of his time to duties similar to those performed by the psychiatrist; he makes the complete study of cases assigned to him (except for the physical and neurological or any other strictly medical examinations) and follows them through to their completion.

Opportunities for research are almost unlimited. From a military standpoint, one of the most significant problems relates to selection of soldier and officer material, i.e., the differential factors concerning those who do and do not adjust to military requirements. Also, there is much that can be learned concerning the dynamics underlying the symptomatology of those who have not adapted; and this in turn should be of value for its mental hygiene applications to non-military life.

To what extent the nature of the professional duties assigned has been determined by such factors as the newness of psychologists in these hospitals and consequent need for a period of mutual adjustment, experience of those commissioned, attitude of those in charge, exigencies of the situation prevailing in specific hospitals and others, it has not been possible to determine. Judging from the reports received, each psychologist now commissioned indicates that his work is being favorably received. In fact, one psy-

chiatrist indicates that such an appointment is "making history" and that he is very pleased to have a psychologist on his staff. Another psychiatrist says that his only complaint is "that our psychological staff is too small to get all the service from it that we know such a department is capable of giving."

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CIVILIAN ASSISTANCE TO MILITARY PSYCHOLOGISTS

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One of the functions of the Emergency Committee in Psychology of the National Research Council has been to help psychologists in the armed forces or in other governmental services to find assistance for their research, and to keep directors of university laboratories informed, whenever and wherever possible, of the kind of research which would presumably be of most value to the war effort. These purposes have not been easy to fulfil, although in a number of instances it has been possible to arrange for profitable exchange of ideas between military and civilian psychologists.

Most of the research being done for the government is supposed to be confidential in nature. It is therefore awkward for men in charge of this research to farm out some of their problems to civilian psychologists, much as they would like to do so. And it has been especially embarrassing to confront civilian psychologists, eager to offer their services, with the statement that no specific directives regarding research in military psychology could be given out. This problem came up for frequent and prolonged discussion during the early meetings of the Emergency Committee. At one meeting it was suggested that Dr. Dael Wolfle and the writer draw up a list of research topics in psychology that would have a more or less direct bearing on the war effort. This list of topics was preceded by the following paragraph.

The tremendous changes made necessary by the war offer many opportunities for American psychologists to engage in study and research of great military and social value. Some of these opportunities involve problems for which immediate answers are urgently needed; others, not so immediately urgent, will prepare for the social problems of post-war readjustment. In working toward solutions of some of the problems the psychologist can proceed by himself. A good many important problems, however, cut across disciplinary boundaries and demand the cooperative efforts of men and women from several different fields of research in the natural and social sciences. Not all of the problems can be solved by 'pure research'; many require a marshalling of whatever evidence can be

found, followed by the exercise of the best scientific, social, and practical judgment available. Some of the problems are particularly suited for seminar discussion and for group recommendation.

Nearly seventy different topics were listed under such headings as sensory and perceptual capacities, problems of selection of personnel, learning and training, morale, and post-war readjustments. In considering these topics the Committee soon realized that almost every problem that psychologists might care to investigate could be thought of as having some bearing on the war effort. Many of the results of investigations into morale, for example, which Dr. Gordon W. Allport secured from seminars in different universities have found useful application in various governmental agencies. Since it was difficult to secure and give clear-cut directives to civilian research, it was therefore decided to encourage psychologists to continue their work in laboratories, libraries, and seminars under self-imposed directives, for at the most unexpected moment the results of their inquiries might be needed and used. A note to this effect was published in the *Psychological Bulletin* (1).

The large number of psychologists now employed by the armed forces and by various governmental agencies makes the need of civilian assistance less urgent than it was a year or so ago, and the number of civilian psychologists who can render such assistance is becoming steadily smaller. With the approach to total war, however, the situation may change in unpredictable ways. Civilian psychologists now engaged in teaching, and therefore unable to devote time to research, may find their courses and students drastically reduced in numbers. In order that there may be no unnecessary loss in efficient prosecution of psychological warfare, the Emergency Committee, either through the writer or through the Office of Psychological Personnel, 2101 Constitution Avenue, Washington, D. C., is eager to be kept informed of available facilities which might, if the occasion arises, be used for the study of problems which originate in the armed services and which can be legitimately turned over to civilian psychologists.

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REVISION OF SELECTIVE SERVICE OCCUPATIONAL BULLETIN NO. 10

Psychology was one of the "critical occupations" listed in Selective Service Occupational Bulletin No. 10, issued June 18, 1942. (See *Psychological Bulletin*, 1942, **39**, 525–528). This Bulletin was revised on December 14, 1942, with the addition of industrial engineering, sanitary engineering, and bacteriology, and with the exclusion of accounting, economics, industrial management, personnel administration, and statistics. In other words, psychology is one of eight specialized fields *in addition to engineering subjects* now listed as having "serious shortages of persons trained, qualified, or skilled to engage in these critical occupations":

Engineering Fields

- Aeronautical Engineers
- Automotive Engineers
- Chemical Engineers
- Civil Engineers
- Electrical Engineers
- Heating, Ventilating, Refrigerating, and Air Conditioning Engineers
- Industrial Engineers
- Marine Engineers
- Mechanical Engineers
- Mining and Metallurgical Engineers, including Mineral Technologists
- Radio Engineers
- Safety Engineers
- Sanitary Engineers
- Transportation Engineers—Air, Highway, Railroad, Water

Other Specialized Fields

- Bacteriologists
- Chemists
- Geophysicists
- Mathematicians
- Meteorologists
- Naval Architects
- Physicists, including Astronomers
- Psychologists

The following sections are quoted from revised Occupational Bulletin No. 10:

4. Deferment of students in training and preparation

A registrant who is in training and preparation for one of these scientific and specialized fields may be considered for occupational classification as follows:

(a) A registrant in training and preparation in one of the Engineering Fields may be considered for occupational classification after completion of his first academic year in a recognized university or college, and thereafter, if he is a full-time student in good standing, if he continues to maintain a good standing in such course of study, and if it is certified by the institution that he is competent and that he gives promise of successful completion of such course of study and acquiring the necessary degree of training, qualification, or skill.

(b) A registrant in training and preparation in one of the Other Specialized Fields may be considered for occupational classification after he has reached the point in such course of study in a recognized university or college, and thereafter, where there remains not more than two academic years for him to complete such course of scientific and specialized study, if he is a full-time student in good standing, if he continues to maintain good standing in such course of study, and if it is certified by the institution that he is competent and that he gives promise of successful completion of such course of study and acquiring the necessary degree of training, qualification, or skill.

5. Graduate Students

A graduate or postgraduate student undertaking further studies in these scientific and specialized fields following completion of his normal undergraduate course of study may be considered for occupational classification if, in addition to pursuing further studies, he is also acting as a graduate assistant in a recognized university or college. A graduate assistant is a student who in addition to pursuing such further studies is engaged in one of the following:

(a) In scientific research certified by a recognized federal agency as related to the war effort; or

(b) in classroom or laboratory instruction for not less than twelve hours per week.

6. Opportunity to engage in profession

When a registrant has completed his training and preparation in a recognized college or university and has acquired a high degree of training, qualification, or skill in one of these scientific and specialized fields, such registrant should then be given the opportunity to become engaged in the practice of his profession in an activity necessary to war production or essential to the support of the war effort. In many instances following graduation from a recognized college or university, a certain period of time will be required in the placing of trained, qualified, or skilled personnel in an essential activity. When a registrant has been deferred as a necessary man in order to complete his training and preparation, it is only logical that his deferment should continue until he has had an opportunity to use his scientific and specialized training to the best interest

of the nation. Accordingly, following graduation from a recognized college or university in any of these scientific and specialized fields, a registrant should be considered for further occupational classification for a period of not to exceed 60 days in order that he may have an opportunity to engage in a critical occupation in an activity necessary to war production or essential to the support of the war effort, provided that during such period the registrant is making an honest and diligent effort to become so engaged.

7. *Effective period of this bulletin*

This bulletin and attached list amends and supersedes Occupational Bulletin No. 10 of June 18, 1942. This amendment is effective until July 1, 1943, unless sooner amended. During the effective period of this bulletin the War Manpower Commission is giving further study to the training and preparation and utilization of persons trained in these scientific and specialized fields.

PSYCHOLOGY AND THE WAR: NOTES

Cleveland Committee for Defense. Dr. Clifton W. Hall, President of the Cleveland Association for Applied Psychology, appointed a Committee for Defense in September, 1941, comprising the following members: Jay L. Otis, Myra E. Hills, Arthur T. Orner, Agnes H. Reigart, and Rosina M. Brown, Chairman.

At the outset it was decided to get as much information as possible from those countries already at war. Newspapers and periodicals were culled for articles on mental and emotional reactions due to the war. Bulletins from the British Library of Information, the Anna Freud News Letters from Hampstead Nursery, and the various surveys made by the British authorities on the effects of evacuation, foster home placement, etc., were excellent sources. The United States Department of Labor also loaned a collection of photostat copies of foreign publications which yielded much information and advice. Abstracts of pertinent articles were made and filed at the Board of Education Branch of the Cleveland Public Library and made available to the community. This material has been used as a basis for talks by various persons dealing with the welfare of the child in wartime.

It was also felt that there was a need for a brief, simple pamphlet which could be distributed to the homes in this industrial community. Although some articles on the effect of war on children have appeared in the local newspapers, many homes are not reached by these papers. Many parents are of foreign extraction or of little schooling. The Committee thought this an opportunity to bring to these parents some general principles of child psychology in simple English. The resulting pamphlet, "Your Family and You," was distributed through the schools and made available to the various community agencies. The Cleveland Board of Education believed the project to be of sufficient value to underwrite the publication.

BOOK REVIEWS

BORING, E. G. Sensation and perception in the history of experimental psychology. New York: D. Appleton-Century, 1942. Pp. xv+644.

The present book is, in the author's plan, the second in a series of three volumes on the history of experimental psychology. His original plan, formulated in 1924, envisaged a volume which would start with a survey of men and schools, and then trace the history of experimentation and thought in the fields of sensation, perception, feeling, emotion, learning, memory, attention, action and thought. But the project expanded to the point where the author decided to publish a separate book on men and schools alone, which appeared in 1929 under the title, *A History of Experimental Psychology*. The criticism, frequently heard that this original work belied its title, because it failed to emphasize the experimental topics as much as it stressed movements, is now answered by the author. He never intended it as a complete coverage, but only as an introduction. This second volume, which covers the fields of sensation and perception, is much more truly a history of experimentation. The promised third volume, which is to cover the remaining fields, will round out the historical picture of what is traditionally understood to constitute the domain of orthodox, experimental psychology, that is, the range of human, adult, normal, general experience and behavior. It is to be hoped that the author will persevere in his endeavor.

The present book forms a natural unit of subject matter, since it is only by a process of artificial abstraction that such a topic as color is assigned to the subject of sensation, while movement is relegated to that of perception. Historically, also, these two topics have developed together; and, except for a liberty which the author has purposely taken, namely, the subordination of historic importance to ultimate significance, an even greater share of the three-volume series might have been devoted to sensation and perception. Fortunately, a great deal of sifting has been done, and the remaining well-screened material has been deflected into a few major hoppers. All topics have been subjected to the following test: "If any event important in the past has no demonstrable indirect effect upon the present, then it should be omitted from a book that tries to recreate the past merely to explain the present." Selah!! And, let it be added, if any event of transcendent importance in the past has a relatively minor effect on the present, then it should be shrunk to a space appropriate to its present and probable future significance. This places the writer of this type of history under a tremendous obligation to overcome biases, see beyond his own interests, and indulge in ruthless surgery. On this basis, however, the author has compressed the sacred cows of Nativism-Empiricism and Weber's Law into parts of chapters, where they occupy no more space than the discussion of such recent subjects as Gestalt dynamics.

The inevitable problem arises of where to end an historical account, especially of those topics which have but recently sprung into prominence. The author effectively spikes the critic's guns by declaring that "it has been my intention to slow down at 1920, and to stop about 1930 except when the momentum of discovery is irresistible as it was in the psychophysiology of hearing, when seventy-year-old problems began to come up for solution in the 1930's. Nevertheless the reader should not trust me after 1930, since I do not trust myself." Could he have been more adroit?

Realizing that a work of this sort may be used more for reference purposes than for continuous reading, Boring has introduced dates after the names of key men each time they have been mentioned, with the idea of orienting the reader with reference to other contemporary contributions. Thus E. H. Weber (1846) has a significance which is quite different from that of E. H. Weber (1852). Throughout the book, the reader feels that Boring has a well-thought-out philosophy about the history of a science; that he tries to psychologize, to look behind the works of authors into the motives which prompt them; in short, that he is engaging in what, to him, is a fascinating hobby. This impression is confirmed in the very last chapter of the book, which is devoted to the subject, "Concerning Scientific Progress." How, he asks, does scientific thinking get on, and, on the other hand, what holds it back? Why couldn't Charles Bell have formulated the resonance theory of hearing? He answers in terms of six principles of limitation: First, that scientific progress at any point waits on the discovery of instruments and techniques; second, that discovery is serial, presupposing other knowledge; third, that insight conforms to the Zeitgeist, rarely departing widely from contemporary thought; fourth, that men are hampered by their own habits of thought, overlooking that which contradicts these habits; fifth, that men's personal attitudes, their egoism and need for prestige divert their thought; and sixth, that social attitudes, the opinion of the in-group versus the out-group, as represented by schools, or national or regional groups, constrain the thought of the members of these groups.

After a preliminary discussion of the major problems of sensation and perception, such as attributes, nativism-empiricism, and the like, and a survey of the development of conceptions of the physiological basis of sensation, the author devotes six chapters to vision, including color phenomena and color theory, and the visual perception of bidimensional space, depth and distance. Then follow three chapters on audition, covering the psychophysics of tone, auditory perception, and auditory theory. Tactual and organic sensibility together occupy approximately as much space as audition, with smell and taste sandwiched into a twenty-page interlude as befits the uncertain state of the topic. A concluding chapter is concerned with the perception of time and movement.

In very few places can the book be said to express strong negative biases, but there are a few. One of them is in a direction for which the reviewer cannot offer a very strong protest, because he shares the same bias. Gestalt psychologists are classed as the modern nativists, because their "givens," like the *phi*-phenomenon, are not to be explained but

merely accepted. This is "faith and not a theory." They are correctly classed with the "phenomenologists" in contrast to the "experimentalists," although many might resent the implications of such a contrast. But the author can hardly be said to under-rate the school, since the closing words of the book read, "He who would understand the nature of the positive contribution of Gestalt theory to psychology needs no better tutor than this history of research and thought on the perception of apparent movement." Regarding modern fruitful adaptations of psychophysics, such as the "law of comparative judgement" and the psychometrics of testing, nothing is said; perhaps because these applications are not strictly relevant to perception, perhaps for different reasons. Again, one is slightly piqued to find certain obscure studies like the More-Frey phase ratio experiment so meticulously documented, while a series of investigations like the Chicago series on the perception of relative motion escape mention, although they develop aspects of the motion problem quite overlooked by Gestalt theory. Occasionally, an interpretation is placed upon an experimenter's results which is in direct opposition to the interpretation made by the experimenter himself, without recognition of the discrepancy. The reinterpretation cannot be objected to, certainly, but it might help to label it as such. An example is the Ewert repetition of the Stratton experiment on prism inversion of the retinal image. Boring's interpretation is probably more correct than Ewert's, but the controversial issues raised by Ewert's interpretation are overlooked. The chapter on organic sensibility is one of the best in the book, due to the author's own intimate personal contact with the field through his researches; the discussion of hunger is a real contribution toward clarity in a topic which has been sadly muddled. The final interpretation cannot fail to delight a functionalist's heart. A mention of Bash's study, involving sectioning of the vagus nerve and splanchnics, would have been quite apropos; for though Bash, in 1939, was repeating Sedillot, 1829, nevertheless the proof that the hunger drive was not eliminated was based on much more objectively demonstrable grounds.

What features of the book are most calculated to enhance its usefulness? First of all, its easy style; since the reviewer doubts the author's expectation that it will be used chiefly as a reference work. It is really readable. Second, the careful documentation both through the dates attached to names, and through the extensive notes at the end of each chapter. Third, the fact that the orientation is around topics rather than around historical periods, which makes it a simple matter to work up the history of a particular subject, such as after-images, without wading through quantities of irrelevant material. Fourth, the historical spiral appearing on the cover page which permits those who prefer a continuous linear view of history to trace the epochs from 1600 to date. Fifth, the illustrations and graphs which have been generously distributed throughout, since it is recognized that often the discovery of some new device or instrument is responsible for the rapid development of some topic which might otherwise have been buried in obscurity.

What conclusions can be drawn from the book regarding the probable future directions of development of this historically dominating field of

sensation and perception in psychology? Some of the major battles of the past have ended, such as the one over sensations of innervation, because further neurological evidence has settled the question; others, such as the problem of "specificity of nerve energies," are approaching final clarification, for a similar reason. Also, controversies like those waged over the rival color theories are dying out, first because work such as Hecht's has made them obsolete, second, because of the growing realization of the hopelessness of working out a comprehensive color theory until many more neurological facts are known. Along with the submerging of the nativistic-empiricistic controversy has gone the problem of local sign, the horopter, etc. Nativism has merged into Gestalt; empiricism into behavioristic operationism. On the other hand, because of new evidence, some ancient controversies have suddenly burst into the open again, such as the relative merits of resonance versus frequency theories of hearing; or the quantitative versus the qualitative theory of differentiation of cutaneous sensations. But what of the future? Two divergent trends seem to be emerging: on the one hand, at the hands of the Gestaltists, phenomenology seems to be taking a new direction, away from elements to dynamic patterns, and to a psycho-neural isomorphism in which brain process is made the exact parallel of phenomenal field; on the other hand, empiricism is seeking an entirely different sort of isomorphism, at the hands of Operational Behaviorism, in which relations of a causal order are sought between neural events and other physiological events involved in the description of experience.

ARTHUR G. BILLS.

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GRAY, J. STANLEY, Editor, and others. Psychology in use, a textbook in applied psychology. New York: American Book Company, 1941. Pp. xii+663.

This volume, composed of an introduction and 12 chapters dealing with various aspects of applied psychology, has been planned to meet the very real need for a textbook in this field. The range of material is wide, with chapters on the following topics: basic principles, problems of every day life, clinical practice, student personnel work, psychology in home life, education, industry, business, law and criminology, medicine, influencing other people, and social reform.

The estimate of whether the purpose of the book has been fulfilled will depend in large part on what one considers the need to be. The present volume provides an exceptionally readable survey of many of the areas in which psychology has application and it is safe to say that the average undergraduate will be fascinated by the material presented. The question may be raised, however, whether the time has not arrived in the development of the science of behavior when even beginning courses should be expected to train students in the techniques of the science, as do courses in applied aspects of chemistry, physics and biology, or whether we should continue to present courses which do little more than introduce the student to an interesting subject, without giving him any technical proficiency in the field. "Psychology in Use" is well adapted to elicit

interest, for it is an excellent exhibit of the most recent results of the psychologist's efforts and desires to be useful, but on completion of such a text the student will have gained little specific knowledge of the methodologies of applied psychology. Perhaps we must still count on using beginning courses to win converts who will go to graduate school for their techniques. Wartime demands make this question a serious one.

This is not to say that the book fails to mention important psychological instruments, such as tests, which are described in four or five different chapters. This scattering of information on testing makes it somewhat difficult to obtain a systematic view of the material, and some will feel that this weakens the presentation. On the other hand, this result is incident to the fact that the chapters are focussed on practical fields as they are actually encountered, a method which does have the advantage of tying in with student interest and set toward these practical problems.

Actually there is surprisingly little overlapping of content in the various chapters of the book and in no other case is there such scattered reference to a topic as has been indicated in the discussion of testing. This has been accomplished by parcelling out, sometimes in a rather arbitrary manner, certain topics to certain writers for discussion. Rating scales, for example, are discussed principally in a consideration of Psychology in Industry, though they are equally important in other connections and could be brought in elsewhere.

In general, the book escapes the triviality that is often a feature of "practical" psychologies, though the chapters are somewhat uneven in this respect. This is to be expected since some fields of application are actually richer in available material than others. This difficulty is apparent in the chapters on "How Is Psychology Used in Everyday Life" and "How Is Psychology Used in Influencing People." The first of these is poorly integrated, being composed of a hodge-podge of topics such as psychology and the motorist, accidents, sleep and relaxation, and the effects of age on behavior. Moreover, some of the content of this chapter is of doubtful relevance. For example, it is hardly a discovery of the science of psychology nor an impressive fact that, "The inevitable presence of soap suds" in bath tubs is part of the explanation of why tubs are slippery.

Many of us have been negatively conditioned to discussions about influencing people. The chapter by that name is superior to most comments on the topic. It is difficult to understand, however, why discussions of this sort so often assume that we are interested only in finding out how to lead people blindly by means of devious techniques of suggestion and flattery. Many people, including some educators, are equally concerned about stimulating critical thinking. Moreover, a great deal in a chapter like this never gets beyond the lore of the man-in-the-street and had better be omitted from a volume until it can be cast into a clearer form. When, for example, the author says, "In most human behavior intelligence is not involved" and emotions are the chief determinants of belief and action, he is not speaking with accuracy and it is doubtful that successful control of behavior lies this way. The discussion that follows emphasizes the importance of appealing to the desire for social approval, for money,

etc. This is sound advice but why use an appeal to these motives as synonymous with an appeal to emotion? And why imply that behavior is either intelligent *or* emotional? Even when response is an unreasoning and automatic reaction to suggestions, it is not necessarily emotional. It may involve merely habitual responses that run off so smoothly that there is no occasion for emotion. Furthermore, acting on motives is not incompatible with using intelligence to reach the goal. But the problem is complex and should not be labored. It is merely questioned that much is gained by superficial treatment of such questions.

HELEN PEAK.

Randolph-Macon Woman's College.

BENDER, I. E., IMUS, H. A., ROTHNEY, J. W. M., KEMPLE, C., and ENGLAND, M. R. Motivation and visual factors; individual studies of college students. Hanover, N. H.: Dartmouth College Publications, 1942. Pp. xix+369.

An earlier study from the Dartmouth Clinic, *An Evaluation of Visual Factors in Reading*, showed in group comparisons that visual defects had no relationship to severity of the symptoms nor to performance on tests and grades. The present study represents a further and more detailed analysis of data for some of these same students. In the present study, however, an attempt is made through intensive case studies to analyze the role of the visual defect in the total personality pattern of the individual. The analysis thus turns from a study of the characteristics of persons in general to a study of the lawful tendencies within individual personality patterns.

In the original study, 636 students in the Dartmouth College Class of 1940 were studied. In the present report 124 of these were selected for intensive study as representing various types of visual and educational conditions. However, the bulk of the report is devoted to case studies of only twenty students. Data are given indicating that these subgroups were representative of the whole class in intelligence, reading and grades; other comparative data are not provided. It must be noted (as the author does point out), however, that Dartmouth students are not a representative group even in their distribution of visual disabilities. Only 2 of the 124 cases were rated by an experienced oculist as representing less than a middle rating on a six point scale of severity of eye difficulty. Further, these tend to be young men from a select social-economic background who are living in the academic atmosphere. Persons from other cultures and in other occupations would obviously have other personality patterns and visual demands. The authors have been careful to limit their interpretations to college students with minor visual disabilities.

The following procedures were used to obtain data on psychological factors and motivation: interviews, autobiographies, projective techniques, behavior descriptions by others, ratings by associates, objective tests, and psychological questionnaries. Complete visual examinations were given. These data were analyzed and checked by at least two workers and written up as psycho-portraits (average length of twelve pages).

On the basis of their evidence the authors feel that they have been unable to determine the effect of visual defects on motivation. In every case, the visual defect was so deeply imbedded within the total personality that its psychological significance was not clear. But it does seem clear to them that the motivational pattern of the individual has determined his reaction to the visual defect. Eye defects cannot be considered as separate and specific but must be considered in terms of the orientation of the total personality. Students with similar eye deficiencies had no more similar personality patterns than individuals with different eye conditions. The correction of an eye defect had no appreciable effect on college achievement. The expressed severity of symptoms was more closely related to the student's motivation pattern than to the degree of his visual defect.

This is an excellent and challenging study. It departs from the usual techniques of treating the results of each test separately and uses descriptive analyses of the personality patterns of each individual. This study suggests that an appreciation of the total personality pattern is necessary before interpretation of a test score may be made.

Criticisms to be made are minor. (1) This study emphasizes the manner in which a student views his own defects. It seems to the reviewer that too many clinical studies deal only with such introspective data. Such material is important, but it is also about time that a form of behaviorism hit clinical psychology. Possibly visual defects have an effect on behavior of which the student is not aware; studies of observable behavior rather than mental reactions might show such a relationship. (2) The case studies seem well done, but the 258 pages of case studies with their mass of detail and complex relationships may be as difficult to assimilate as raw data through normal reading techniques. Yet any one case study seems almost too concise when a thorough study is made of it. This difficulty, however, is inherent in the approach used. (3) A correlation of .613 (pp. 35–36) between measures of aniseikonia at distant and near vision is interpreted as follows: "translated into terms of prediction, the coefficient indicates the presence of both distant and near aniseikonia in approximately twenty per cent of the cases." While twenty per cent of the cases in this group may have had both defects, one cannot necessarily *predict* that an equal per cent of cases will have two defects when such a correlation is obtained with another group, *i.e.*, one in which visual efficiency ranges from average to extremely deficiency vision.

FRANCIS P. ROBINSON.

Ohio State University.

BOOKS AND MATERIALS RECEIVED

FRY, C. C. (with the collaboration of EDNA G. ROSTOW). Mental health in college. New York: Commonwealth Fund, 1942. Pp. xiv+365.

LOWINGER, A. The methodology of Pierre Duhem. New York: Columbia University Press, 1941. Pp. 184.

MOORE, H. Psychology for business and industry. (2nd Ed.) New York: McGraw-Hill, 1942. Pp. xiv+526.

STERN, EDITH M. (with S. W. HAMILTON). Mental illness: a guide for the family. New York: Commonwealth Fund, 1942. Pp. xvii+134.

VARNUM, W. C. Psychology in everyday life. New York: McGraw-Hill, 1942. Pp. xiv+490.

WOLF, ANNA W. Our children face war. Boston: Houghton Mifflin, 1942. Pp. vii+214.

———. Report of the Eleventh annual conference on delinquency prevention (sponsored by The Division for Delinquency Prevention in coöperation with the Big Brothers and Sisters Association of Illinois). Illinois: Department of Public Welfare, 1942. Pp. xviii+ 222.

NOTES AND NEWS

CARL CAMPBELL BRIGHAM, professor of psychology, Princeton University, died, January 24, at the age of fifty-two years. He had served Princeton as instructor (1916–17), assistant professor (1920–24), associate professor (1924–27), and professor since 1928. He was also associate professor of psychology at Cooper Union, New York City, a member of the Committee on the Classification of Military Personnel, and research secretary of the College Entrance Examination Board.

ELIZABETH EVANS LORD, psychologist of the Children's Hospital of Boston, Mass., died, January 10th.

The Illinois Association for Applied Psychology is the new name for the group formerly known as the Illinois Society of Consulting Psychologists. The change is one in name only and the purposes, activities, and membership requirements of the group remain the same. The officers for the year 1942–43 are: *President*, ANDREW W. BROWN; *Vice-president*, ARTHUR W. KORNHAUSER; *Secretary-treasurer*, MILTON A. SAFFIR; *Members-at-large of the executive committee*, ADAM R. GILLILAND, MELVIN S. HATTWICK, and HELEN L. KOCH. The Association issues a monthly mimeographed News Letter which attempts both to summarize developments in the applied field in the state of Illinois and to report Association activities. The mailing list of the News Letter has recently been opened to non-member psychologists in the hope of increasing the solidarity of the profession in the state. Any member or associate of the APA who would like to receive the News Letter will be placed on the mailing list, if he will send his name and address to the editor, DR. FRANCES A. MULLEN, Bureau of Child Study, Board of Education, Chicago.

JOHN A. COOPER, formerly psychologist at the Eastern Penitentiary, Philadelphia, has been appointed instructor in psychology, State Teachers College, Frostburg, Md.

IRVING LORGE, executive officer, division of psychology, Institute of Educational Research, Teachers College, Columbia University, has been named director of an exploratory study of the meanings of economic competence. The Consumer Education Study of the National Association of Secondary School Principals has joined with the Lincoln School of Teachers College in providing funds for the study.

FRANK N. FREEMAN, dean, School of Education, University of California, has been selected by J. P. Nourse, superintendent of schools, San Francisco, to direct a revision of the elementary-school curriculum. Dean Freeman will be assisted by "two specialists in education in universities and colleges and three principals of elementary schools."

LOUIS W. GELLERMAN, associate professor of education, Southern Illinois Normal University (Carbondale), has accepted an administrative post in the public schools of Seattle.

GEORGE KATONA, fellow of the John Simon Guggenheim Foundation for 1940–42 and lecturer of psychology at the New School for Social Research, New York, has been appointed Associate Director of the Committee on Price Control and Rationing of the University of Chicago. The Committee is organized under the auspices of the Cowles Commission for Research in Economics and the Price Conference of the National Bureau of Economic Research, for the purpose of conducting a field study into the effects of price control.

ROBERT T. ROCK, JR., and FRANK A. GELDARD, psychologists in the Office of the Air Surgeon, Army Air Forces, have been promoted from the rank of Major to that of Lieutenant Colonel.

CHARLES H. JUDD, professor emeritus of education, the University of Chicago, is serving as expert consultant to the War Department at the Army School for Special Service. The school has recently been moved from Fort Meade (Md.) to the campus of Washington and Lee University (Lexington, Va.), and the course of instruction extended from four to six weeks.

DRS. HELEN L. KOCH and HELEN SCHACTER are participating in an extensive program for the training of volunteer child care aides in the Chicago area. Two-hundred and fifty volunteers in four training centers are being trained.

An interneship in psychology has been established at the University of Illinois College of Medicine, Department of Psychiatry. MISS EILEEN SINCLAIR, of Manitoba, Canada, is filling this position for three months. DR. IRENE C. SHERMAN will direct her work.

MISS MARJORIE BREMNER, formerly psychologist with the Bureau of Child Study of the Chicago Board of Education has completed her basic training with the WAVES and has recently been assigned to the Bureau of Naval Personnel in Washington.

Applications to the Committee for Research in Problems of Sex of the NRC for financial aid in the year beginning July 1, to support work on problems of sex and reproduction, should be received before April 1. They may be addressed to the Chairman, DR. ROBERT M. YERKES, Yale School of Medicine, New Haven, Conn. Although hormonal investigations continue to command the interest of the committee, preference, in accordance with current policy, will ordinarily be given to proposals for the investigation of neurological, psychobiological and behavioral problems of sex and reproduction.

Associates and Members are requested to interest qualified persons in affiliation with the American Psychological Association. Letters have

recently gone to Associates of five years' standing calling attention to the method and qualifications for transfer. The deadline for applications for Member is March 15, 1943, for consideration at the September, 1943, meeting. The deadline for applications for Associateship is July 1, 1943. Application blanks are available at most departmental offices or may be obtained directly from the Secretary, WILLARD C. OLSON, University of Michigan, Ann Arbor, Michigan.

Books for Prisoners of War. A request has been received from the War Prisoners' Aid of the Young Men's Christian Association for books in the field of psychology, to be sent to allied prisoners of war who are in Axis hands. In the prisoner of war camps, there are teachers and graduate students in psychology, as well as classes organized by the prisoners themselves; requests for psychology textbooks and treatises are therefore frequent, and their provision is a great lift to morale. War Prisoners' Aid has had success in getting books into the hands of prisoners of war and from time to time prepares shipments to be sent across the seas.

One difficulty in transmitting books is that before shipment the approval of the censor of each book has to be obtained. Hence, a general request for donations to which, without doubt, many psychologists would respond, would be of little value. The procedure now worked out is that of requesting each psychologist to make up a list of the books that he is willing to donate for this worthy purpose and send it to MR. PAUL B. ANDERSON, War Prisoners' Aid, World's Committee of the Y.M.C.A., 347 Madison Avenue, New York City, who will check the lists with the censor and write to the prospective donor informing him which books will be accepted. Books sent to prisoners of war may not have any marks or erasures in them and the date of publication may not be later than September 1, 1939.

It is hoped that many psychologists will respond to this appeal by sending books within their own field. There have been requests from prisoners of war for technical and professional books, as well as for more popular types of books which are made available through other than professional sources.

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Psychological Bulletin

THE ANALYSIS OF VARIANCE IN PSYCHOLOGICAL RESEARCH*

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The statistical techniques subsumed under the general term analysis of variance, and associated with the name of R. A. Fisher (**13, 15**), have for some time been employed in agriculture, biology, and related fields. Fisher's book, "Statistical Methods for Research Workers," first published in 1925, has gone through seven editions; while its companion volume, "The Design of Experiments," first published in 1935, is now in its second edition. Fisher's methods were, naturally enough, first taken up in this country by those primarily interested in agricultural research. Several excellent books have appeared in which Fisher's designs are described and illustrated in this general field (**18, 30, 39**).

Analysis of variance has not, as yet, been widely used in psychological research (**3**) or in the social sciences (**9**). Even as recently as 1940, the author of a textbook (**26**) in which Fisher's methods are applied to problems in educational research, found it necessary to use artificial data in several instances because of the lack of experimental material in this field. The neglect of Fisher by psychologists has been owing in part to the difficulty which many encounter in following Fisher's treatment. Moreover, the belief that Fisher's methods are concerned chiefly with small samples has doubtlessly had its influence; as has also the difficulty which arises in readily translating experimental designs dealing with soil fertility, weights of pigs, effectiveness of manurial treatments and the like over into a psychological framework.

* Garrett is responsible for Sections I, II, III, V and VI; Zubin for Sections IV and VII. Dr. John W. Fertig read the manuscript and gave valuable suggestions.

The present review attempts to outline and explain the experimental designs in which analyses of variance* are useful. A minimum of theory has been introduced, as theory and methods of calculation are readily available in several textbooks. What we have tried to do is to cite experiments in which Fisher's experimental designs are used; to explain why they are valuable; and to indicate some of the situations in which we believe analysis of variance techniques offer a more efficient method of attacking the problem than those currently in use.

I. Meaning of Analysis of Variance

In experimental work in which many measures (*e.g.*, scores) have been obtained from individuals or groups, it is often important to be able to separate out or differentiate the factors which contribute to individual or group differences. The measure of variation analyzed is usually the variance, or σ^2, instead of the σ. A simple illustration will show why σ^2 is used. Let Z be a variable which is composed of two components X and Y. X and Y are indicative, say, of masculinity-femininity characteristics; men tend to have higher scores in X, women higher scores in Y. For any individual, Z is the sum of his X and Y scores. Then $Z=X+Y$, or $z=x+y$ when measures are taken from their respective means. Squaring, summing, and dividing by $N-1$ we have

$$\frac{\sum z^2}{N-1}=\frac{\sum x^2}{N-1}+\frac{\sum y^2}{N-1}+\frac{2\sum xy}{N-1}.$$

Now if X and Y are independent so that $r=.00$,

$$\frac{\sum z^2}{N-1}=\frac{\sum x^2}{N-1}+\frac{\sum y^2}{N-1}$$

and the variance of Z has been analyzed into two parts. The proportion which each variance contributes to differences in Z may now be readily determined. Should X and Y *not* be independent, so that

$$\frac{\sum z^2}{N-1}=\frac{\sum x^2}{N-1}+\frac{\sum y^2}{N-1}+\frac{2\sum xy}{N-1},$$

we have, in addition to the independent contributions of X and Y, their joint contribution through $\sum xy/(N-1)$. This last term is

* Analysis of variance, as a general term, covers also analysis of covariance.

called the *covariance* of X and Y, and its relation to correlation is readily apparent. When comparable groups are combined, the variance of the resulting inclusive group may be broken down into the sum of the variances and covariances of the component groups. Because of the additive nature of variances, they are analyzed instead of the σ's, when one is seeking the contributing causes to group or individual differences.

An instance in which the variance of a final measure is analyzed in terms of its components is Shuttleworth's study (**36**) of the contributions to differences in IQ of heredity, environment, and accidents plus intra-family environmental differences. Let x=IQ, h=heredity, e=environment, and a=accidents, etc.; then if $x=h+e+a$,

$$\sigma_x^2 = \sigma_h^2 + \sigma_e^2 + \sigma_a^2 + 2r_{he}\sigma_h\sigma_e.$$

Going on from here, Shuttleworth analyzes the variations in IQ into the proportions contributed by the factors h, e, a, and he in combination. In the studies of Roff and Roff (**32**) and of Rubin-Rabson (**33**), the total variance of a final result is analyzed into several components. The relative weights of these components are determined from the percentage which each contributes to the total V.* All of the examples cited use fairly simple experimental designs. But no matter how complex the final analysis, the breakdown of the total variance into components and contributing variances is the essential objective of the method.

II. Simple Classification of Variates

The simplest problem in which the analysis of variance approach is often profitable is that in which there are several independent groups of subjects upon all of whom the same measurements have been made. To illustrate, suppose that a test of memory-span for digits has been administered to 5 groups of children (100 in each group) of different national or natio-racial origin, for example, American, Chinese, Mexican, Italian, and Japanese. Our problem is to discover whether these groups differ significantly in memory span. Fisher has shown that the best working hypothesis in situations like this is the "null hypothesis" (**13, 18**); that is, the assumption that there are no "real" differences among our groups. Put somewhat more precisely, the null hypothesis assumes that our 5 samples have been drawn in the same way from

* Variance.

some defined parent population; and that these samples do not differ from one another except through fluctuations which inevitably arise from sampling. The purpose of our experiment may be said to give the facts a chance to disprove this null hypothesis. A null hypothesis, since it is the statement of a negation, can be disproved or refuted but can never be proved. However, if the null hypothesis is *repeatedly* refuted (as for instance in the present illustration), we may finally be led to conclude that there *are* real differences among our groups. But such a generalization—which is the goal of the inductive method—represents a formulation based upon logical consideration as much as upon statistical tests.

To return to our 5 groups, the first step in the analysis of our data is to calculate an over-all or total variance, V_t, from a combination of the scores from all 5 groups. V_t may then be separated into two parts, one portion being the V *within* groups (V_w), the other the V *between* groups (V_b), or among the weighted means of the 5 groups. The calculations (**37**) which involve only simple arithmetic may be tabulated in the following way (data are artificial):

TABLE I

Source of Variation	*Degrees of Freedom*	*Sum of Sqs.*	*Mean Sq. (Variance)*
Between groups	4	8	$2(V_b)$
Within groups	495	990	$2(V_w)$
Total	499	998	$2(V_t)$

Test of Significance, $F = V_b/V_w = 2/2 = 1$

Under "Source of Variation" we place the total V and the two parts which make it up. To obtain the mean square or variance attributable to the "total," "within," and "between" separately, we divide the sum of squares segregated under each category by the DF (degrees of freedom) assigned to it. Finally, to discover whether the mean differences among our five groups are significant, we divide V_b by V_w to get the quantity "F."* The distribution of these F-ratios has been found, and tables (**18, 37**) giving the values of F for different degrees of freedom in numerator and denominator have been calculated at the two critical points, .05 and .01. For an F, the numerator of which has 4 DF and the

* It is possible to test the significance of the "between means" variance in terms of the "within" variance by using Fisher's z-distribution (**18, 30**) instead of the F-distribution. Since $z = \frac{1}{2} \log_e F$, the two tests give the same result. The F-test is somewhat easier to use.

denominator 495 *DF*, the .05 point is 2.39 and .01 point is 3.36. These values may be interpreted to mean that on the null hypothesis (*i.e.*, assumption of no real differences among groups), repetitions of our experiment would 5 times in 100 trials give *F*'s as large as (or larger than) 2.39; and once in 100 trials would give *F*'s as large as (or larger than) 3.36. It is clear that our *F* of 1.00 is not significant, as it is less than the .05 value, and would occur much more often than 5 times in 100. Hence the null hypothesis is *not* disproved, and there is no evidence that the differences among our group means are the result of anything more than sampling fluctuations.

Several points raised by this problem must be considered further. The concept of "degrees of freedom" will be new to many psychologists (**43**). The roots of the notion lie in fairly difficult mathematics, but the rationale of its usage is readily apparent. *DF* refers to the independence or lack of restrictions in the data. If we have 10 scores and their sum, this series possesses only 9 degrees of freedom, since in the case of 9 scores and their sum the tenth is at once determined. If we calculate the mean (which is based, of course, upon the sum) from a distribution, we use up 1 *DF*. In the example above, the *DF* for the total is 500−1 or 499; for between groups, it is 5−1 or 4; for within groups it is 499−4 or 495. The last *DF* may also be determined as follows: since there are 99 *DF* in each group (100−1) and 5 groups, 99×5=495.

The conventional method of attacking a problem in which 5 groups are to be compared for mean performance is to calculate the means and standard errors of the means for each group. The 10 possible comparisons of means are then made [each in terms of its s.e. (difference)] and the critical ratios are evaluated in terms of the probability that such a difference (or a greater) can be attributed to sampling alone. Analysis of variance is superior to the conventional method in several respects. *First*, it should be noted that the standard error (here the within groups *V*) is based upon *all* of the data instead of upon 1/5, and hence is a more stable estimate of experimental error than are the s.e.'s calculated from the separate groups. Throwing our groups together is in accordance with the null hypothesis which we have assumed, namely, that the *M*'s of our 5 groups are essentially equal. To be sure, this null hypothesis may be disproved. But even if it is, the *F*-test is not thereby invalidated, since the net effect of such a finding is to increase *F*—if anything—and hence render the test of significance more sensi-

tive. *Secondly*, the F-test provides an over-all test of significance. If it is *not* significant, ordinarily no further test need be made; for none of the mean differences is likely to be significant. If it *is* significant, then the individual M's may be compared and their differences evaluated in the usual way. A significant F does not guarantee that *all* mean differences are significant. *Thirdly*, an experimental error based upon the *within* groups variance provides an estimate of the population variance from which differences in group means have been eliminated. Hence, we get a valid estimate of experimental error even when true differences exist among means. *Finally*, note that *all* of the variances in our table, "total," "within" and "between" are the same: namely, 2.00. When the total V equals the "within" and the "between," the several groups may be treated as samples drawn from the same population:—the null hypothesis is not refuted. Under these conditions, the three estimates of variance are equally good gauges of experimental error. The discrepancy between the V_b got from the M's and the V_w from within groups is thus a direct measure of the extent to which the means differ.

The simple experimental design described above has been used in several studies in psychology.

Schrader (**34**) has investigated the relation of scores made by college freshmen on a liberalism questionnaire to such variables as best-liked high school subject, mother's education, father's education, father's occupation, and the like. The questionnaire contained 186 statements and covered various types of social problems dealing with labor, race relations, economic relations, and nationalism. There were 149 subjects. Table II shows the data when the men subjects were grouped into 10 categories in accordance with their expressed preferences for high school subjects:

TABLE II

Source of Variation	*DF*	*Sum Sqs.*	*Mean Sq.* (V)
Between the 10 categories	9	5.33	.59
Within groups	139	157.21	1.13
Total	148	162.54	

$$F = .59/1.13 = .5 \quad F\begin{cases} .05 = 2.00 \\ .01 = 2.63 \end{cases} \qquad (37)$$

The nonsignificant F (.5) gives no evidence of other than a chance relationship between liberalism and best-liked high school subjects. When, however, the masculine subjects were grouped into *two* categories—those whose mothers went to college and those whose mothers did not—the F-test for these groups was 9.2, which should be compared with an .01[$F_{.01}$] of 6.8 (obtained from the table of F). We must expect, therefore,

an F of 6.8 (or larger) to result from sampling fluctuations once in 100 trials; and accordingly, the F of 9.2 is quite significant of a real difference between the liberalism scores of students whose mothers went to college and those whose mothers did not attend college.

One of the problems attacked by Rietz (**31**) was that of discovering whether students admitted to college from High School A over a five year period varied significantly in intelligence from year to year. Intelligence was measured by the American Council Intelligence Examination and was expressed in percentile scores. For 121 students admitted to college over a five year period, we have the following data:

TABLE III

Source of Variation	*DF*	*Sum Sqs.*	*Mean Sq.* (V)
Between the 5 groups	4	236.97	59.24
Within groups	116	570.14	4.92
Total	120	807.11	

$$F = 59.24/4.92 = 12.0 \quad F\begin{cases} .05 = 2.45 \\ .01 = 3.49 \end{cases} \qquad (37)$$

The F is larger than the .01 point, and it is clear that the students from high school A have varied greatly from year to year. The admitting college evidently cannot count upon receiving regularly groups of either good or poor students from this high school.

Dressel (**8**) has employed analysis of variance in attacking the question of the relationship between grades received in high school and later college success. In the 15 high schools studied, significant differences were found among the schools in grades assigned these students. The college grades received later by these students, grouped according to the high schools from which they came, varied much less than the wide differences in high school achievement might have led one to expect. Evidently, the marking standards employed by the high schools varied from school to school, and differed from those used by the colleges.

Jellinek (**23**) has used analysis of variance in several interesting physiological studies at the Worcester State Hospital. In one of these, the caloric output of 72 male schizophrenics was recorded under fasting conditions 12 (or less) times. The variations within and between individuals (called the *intra-* and *inter*-individual differences) were compared with the same measures obtained from normal controls. The inter-individual variance of the normals was significantly less than that of the patients. Jellinek writes: " . . . investigations in this hospital have shown that normal controls, although somewhat heterogeneous for most physiological variables, form a more compact group than schizophrenic patients" (p. 37).

The experimental design illustrated above has been employed most often in situations in which the groups compared were independent. If groups are *paired* initially person for person in some function, and later measured in the same or a related function; or if groups are matched initially (say for M and σ), analysis of vari-

ance may still be employed. Shen (**35**) has derived the formulas appropriate for use under these restricted conditions.

III. Multiple Classification of Variates

The method of analyzing the variance *between* and *within* groups can readily be extended to apply to more complex experimental designs. The chief difference lies in the larger number of groups needed and in the more complex relations among them. An example will serve to introduce certain new terms.

In one experiment (**11**), blood cholesterol readings (mg./100 cc.) were taken on 18 individuals during the months of April and May. The average reading for April was 144.91 and for May, 150.16. Is this rise significant? Data may be arranged as follows:

TABLE IV

Source of Variation	*DF*	*Sum Sqs.*	*Mean Sq.* (V)
Between months	1	248.0	248.0
Between individuals	17	4337.0	255.1
Interaction	17	1907.7	112.2
Total	35	6482.7	

$F=248/112.2=2.21$ $F\begin{cases}.05=4.45\\.01=8.40\end{cases}$ $F=255.1/112.2=2.27$ $F\begin{cases}.05=2.30\\.01=3.30\end{cases}$

It will be seen that instead of an analysis into *between* and *within* months, the within months variance has been separated into two parts: a new classification, "*between* individuals," and a term called "interaction." There are two determinations for each individual (one in April and one in May), and the new classification, "between the weighted means of individuals," enables us to find whether individuals differ significantly in blood cholesterol regardless of the month in which the reading is taken. Interaction is a measure of *experimental error*. This term gives a measure of the *per-month* fluctuations of the 18 subjects; it represents the variations arising from the fact that these subjects reacted differently on the two occasions. If each of our 18 *S*'s (subjects) had given the *same* reading in May as in April, *all* of the V would then be between individuals and there would be no interaction. Or if all *S*'s had returned identical readings in April and in May (each reading in May, however, being 10 points higher than in April), there would have been no interaction, *all* of the variation being then attributable to differences in the months (**18, 20, 39**).

Entering the table of F, first, with 1 and 17 *DF*'s (**37**), it is clear that the value 2.21 is *not* significant and that the blood

cholesterol readings did not really differ in April and May. It appears from the second F-test that individuals are almost—but not quite—significantly different in their blood cholesterol readings. An F of 2.30 might be expected to occur by chance only once in 20 trials, and the obtained F is 2.27.

Several aspects of this analysis may now be discussed at greater length. *First*, the total V has been analyzed into the V contributed by the *differences* in months, by the *heterogeneity* of the S's, and by the *interaction* of subjects on months. This last V is a measure of the failure of the S's to react in the *same way* to the experimental situation and hence is the most valid measure of the uncontrolled variation called experimental error. *Secondly*, it may be noted here that the F-test is essentially the same as the t-test (the critical ratio) when two groups only are to be compared. In fact, when two means are compared, $F=t^2$. In the problem above, the mean difference between months is 5.25 and the standard error of this mean is 3.53. Also, $t=5.25/3.53$ or 1.487, and for 17 DF (there are 18 differences) P is .156. Thus t^2 (*i.e.*, 1.487^2) is 2.21, which equals F. When several groups are to be compared, F is the better (more inclusive) test because it supplies an over-all test of significance. If F is *not* significant we need go no further. But if F is significant then the t-test should be applied to the separate comparisons, as F does not tell *which* differences are significant—but simply that some are. *Thirdly*, it should be remembered that when the measures or scores of two groups are pooled, equal σ's in the two groups are assumed, *i.e.*, the two groups are taken to be samples of equal variance drawn from a common population or from comparable populations. This condition, known as *homogeneity of variance*, is a prerequisite to analysis of variance. When means differ significantly, not only these parameters but the σ's within groups may differ, and the differences in σ may contribute to the mean differences. Tests for the homogeneity of variance (**21**) should be utilized when there are many groups and when doubt exists as to the comparability of their σ's. It is fortunate that the F-test is usually valid when the σ's of the groups to be compared are not equal (**26**), provided the discrepancy is not great.

The reader should note that had the analysis of variance in this problem been into *between* and *within* months, with 1 and 34 DF respectively, the experimental error would have been 183.7 (mean of 255.1 and 112.2) instead of 112.2. *All* subject variance—the within variance as well as the interaction variance—is now in-

cluded in this estimate of experimental error. It is clear that a design in which the experimental error is thus inflated decreases the precision of the result obtained.

The present methods of analysis of variance may often be usefully applied in experiments involving a number of practice trials.

Garrett (**16**), for instance, had *S*'s learn materials of different levels of difficulty under conditions of massed and spaced practice. One question raised by the experiment was whether sample (group) variance contributed more towards individual differences than did practice variance (*V* between means). The total variance in each set of practice trials was analyzed into the *V* between trials, the *V* within groups, and the interaction between *S*'s and practice trials. As was expected, both subject and practice variance contribute significantly in terms of experimental error (interaction). To test the relative strength of these two factors, practice variance was divided by sample variance and the resulting *F* evaluated in terms of the appropriate *DF*. In all cases but one, practice variance contributed more to total (*i.e.*, individual differences) than did subject variance, though not all differences were significant. The hypothesis is advanced that intensive practice is more potent than original nature (as measured by sample variance) in effecting differences in individual performance. But this conclusion is limited by the nature of the sample (college students) and by the character of the tasks.

A number of examples in which analysis of variance is an essential part of the experimental design may be found in the monograph by Jackson (**21**). One useful example (pp. 34–42) shows under what conditions several groups may be considered to be samples of a common population and combined into a single group.

IV. The Latin Square and the Greco-Latin Square

In some experiments the sequence or order of the experimental factors or situations in space or in time has a bearing upon the outcome. Agricultural is replete with such instances; and the spatial location of the plots in a field is often of great importance due to the possibility fertility gradients that may exist. Better results are expected from certain plots simply because of their location, and regardless of the treatment (*e.g.*, fertilizer).

In psychology, spatial position is often an important consideration, especially in experiments in psychophysics and in perception, and special methods have been devised to take account of this factor. Temporal order or sequence is also important and has received considerable attention in experimenta design. In fact, the rotation experiment in which groups are tested in regular sequence, or experimental factors introduced in some systematic order, was

devised with the avowed purpose of equalizing the time-order of experimental application. The experimental design known as the Latin Square provides a means of evaluating and eliminating the factors of spatial and of temporal sequence through analysis of variance methods. An example will illustrate the method.

In a recent experiment,* it was desired to determine whether the accuracy of recognition of colors differs markedly when the colors are presented to the dark adapted eye under various degrees of illumination. Colors selected were yellow, green, blue, and red. Four levels of illumination were chosen ranging from just no illumination through a graded series of intensities to a degree of illumination in which all subjects recognized correctly all the stimuli. Table V gives the experimental plan. The numerical entries in this table consist of the per cent of the experimental group who recognized each color correctly. Note that the table is so arranged that each color is presented *once* in the first, second, third, and fourth place at each of four levels of illumination; and *once* in first, second, third and fourth place in each series. This scheme produces a 4×4 table in which the fours columns and the four rows provide random arrangements of the colors. In consequence the variation in columns and rows represents a random variation which is independent of the influence of both order and of level

TABLE V

To Illustrate the Latin Square

The Four Colors, *R*, *G*, *Y*, and *B* are presented in such a way as to rotate out the Effects of Order and Position, and thus Equalize any Practice Effects.

Presentation Series	*Illumination Levels* 1	2	3	4
a	*R*	*B*	*Y*	*G*
b	*G*	*R*	*B*	*Y*
c	*B*	*Y*	*G*	*R*
d	*Y*	*G*	*R*	*B*

of illumination upon the recognition of the colors. This random variation in columns and rows will, however, decrease the average accuracy of performance. By segregating these influences, the effects of order and of illumination level are removed, and the accuracy with which the colors are recognized can be more precisely determined. Eliminating these sources of variation becomes, therefore, an effective means of error control. The analysis of variance takes the form shown in Table VI.

* Unpublished study by W. E. Vinacke.

TABLE VI

Source of Variation	*DF*	*Sum of Sqs.*	*Mean Square* (*V*)
Among rows	3	..	*V* (rows)
Among columns	3	..	*V* (columns)
Among colors	3	..	*V* (colors)
Residual error	6	..	*V* (error)
Total	15		

$$F = \frac{V\text{ (colors)}}{V\text{ (error)}}$$

It will be noted that the data have been analyzed into three sources of variation: intercolumns (illumination levels), inter-rows (order of presentation) and intercolors. Separated out also is the residual variance attributable to error. By means of the *F*-test, the variance of the accuracy of recognition of the different colors may be compared with the error variance, and the significance of the obtained differences determined. The variance due to rows (order) and the variance due to columns (illumination) can also be evaluated by the *F*-test. These factors are ordinarily of secondary interest in most experiments; but their size and their significance are often of value as indications of the effectiveness of our experimental controls.*

In another part of the experiment quoted above a study was made of the *form* of the stimulus instead of the color. An analysis similar to that in Table VI can be made of this situation, but it may be noted that such an experiment leaves unanswered the question as to the combined effect of color and form. To deal with this problem, we should have to use a Greco-Latin Square. In this experimental design, each color and each form are combined in such a way that only one combination of each sort occurs; and these combinations may then be treated as a Latin Square (**13, 41**).

V. Factorial Methods

Because they permit an experimenter to study simultaneously the action of two or more independent variables, the factorial methods of R. A. Fisher (**2, 18**) will prove especially valuable in many problems in experimental psychology. In factorial designs, each

* It should be noted that the use of percentages in an analysis of variance is not defensible, since the variance of a percentage itself ($\sigma^2 = pq$) and hence the variances of the columns and rows will not usually be equal. In order to circumvent this difficulty it would be well to transform the percentages into some other function whose variance is independent of the level of the functioning, *e.g.*, $\theta = 2 \sin^{-1}\sqrt{p}$; $\sigma_\theta = 1/\sqrt{N}$.

variable may occur at two or more levels or strengths, and the effects of the variables at each level (singly and in combination) may be investigated. Perhaps an example will provide the simplest introduction to this experimental design. Suppose that an experimenter (E) wishes to measure the relative strengths of thirst, hunger, and sex-deprivation in the white rat (**44**). The measure of each "drive" might be taken as the *number of times* a male white rat crossed an electrically charged "grid" after a given number of hours of deprivation from water, food, or sex-activity. For simplicity of design, let us suppose that each of our experimental variables occurs ar *two* levels, namely, *no* deprivation and x hours of deprivation. (More than two levels could, of course, be introduced.) We may set up our experiment as follows, the capital letters meaning presence of, and the small letters absence of the drives:

Variables	*Strengths or Levels*	
	Presence	Absence
Thirst	*T*	*t*
Hunger	*H*	*h*
Sex	*S*	*s*

There are 8 possible combinations of stimuli by which an animal may be affected: *THS*, *THs*, *Ths*, *ThS*, *tHS*, *tHs*, *thS*, *ths*. In the first situation, *i.e.*, *THS*, the animal is deprived of water, food, and sex; in the second, *THs*, of water and food, but not of sex, and so on. In the last experimental situation, *ths*, all three drives are at the zero level of deprevation, *i.e.*, at "normal." A total of 8 rats, one assigned to each experimental situation, is necessary to give the following form of analysis:

Source of Variation		*DF*	*Sum Sqs.*	*Mean Sq.*
Main Effects	*T*	1		
	H	1		
	S	1		
Interactions	*TH*	1		
	TS	1		
	HS	1		
	THS	1		
		7		

The letters T, H, and S, represent the "main effects" or the action

of the variables, taken separately, in causing the rats to cross the grid. *TH*, *TS*, *HS*, are the simple interactions of two factors, and *THS* is the one triple interaction. These interactions give the joint effects of two or of three factors in combination. Eight rats provide only one animal for each situation, and hence there is no measure of experimental error, as the outline above indicates. In order to provide a measure of the variability to be expected under the various conditions, the *E* would certainly "replicate" or repeat his experiment putting several rats through each variable-combination. Suppose that 8 rats were tested in *each* of the 8 experimental situations. The total group would then consist of 64 animals, the variance of whose "scores" (crossings) could be analyzed as follows:

Source of Variation	*DF*
T	1
H	1
S	1
TH	1
TS	1
HS	1
THS	1
Error	56
	63

One degree of freedom is assigned to each of the factors since each occurs at two strengths or levels. The *DF* of the interactions are simply the product of the *DF*'s assigned to the two (or three) interacting factors. There are 56 *DF*'s available for estimating the error variance, that is, the variability to be expected when several animals perform the same task. Note that if there had been 32 animals, providing 4 replications, there would have been 24 *DF*'s available for estimating error.

The significance of each factor may be found by dividing its *V* by the error *V* and evaluating the resulting *F* with due regard for the *DF*'s in the two *V*'s. The significance of the interactions is found in the same way.

It is worth considering further just what is meant by the significance of the main effects and of the interactions. Suppose that *H* is significant by the *F*-test. This would mean that hunger will cause a rat to cross the grid more often than lack of hunger; and

this is true when the other factors vary as to strength and combination. A significant interaction, say *HS*, means that hunger *and* sex-deprivation will cause a rat to attempt to cross the grid more often than will the normal rat ("normal" for these two conditions), whether he is thirsty or not.

The number of experimental variables and the levels at which they operate may be increased over those in our example. But it seems likely that 5 or 6 variables at 3 or 4 levels of each is about the limit of practical usefulness.

Crutchfield (5) (6) has carried out an experiment, using white rats, in which there were 5 factors each at 3 levels or strengths. The factors were concerned with various aspects of a string-pulling task, such as force of pull, length of string, training period, etc. Each experimental factor occurred at 3 levels. The outline of the experimental design was as follows:

Source of Variation		*DF*	*SS*	*MS(V)*
Single Factors	*A*	2		
	B	2		
	C	2		
	D	2		
	E	2		
Interactions, Two factors	*AB*	4		
	AC	4		
	AD	4		
	AE	4		
	BC	4		
	BD	4		
	BE	4		
	CD	4		
	CE	4		
	DE	4		
Complex Interactions; more than two factors (error)		192		
Total		242		

Since each factor occurs at 3 levels, each has 2 *DF*'s. Each simple interaction has 4 $DF(2 \times 2)$. Five factors each at 3 levels will provide 3^5 or 243 experimental situations; and hence 243 rats are needed in order to represent each experimental situation by *one* animal. The lack of replication would ordinarily be inadvisable, as it permits of no estimate of error. Where there are so many complex interactions, however, those of 3, 4, and 5 factors may be taken—as here—to give a fair measure of the differential reactions of the animals to the experimental situations, and hence provide an estimate of experimental error.

Crutchfield and Tolman (7) have summarized the advantages of factorial design over the conventional single-variable set-up. Their points will be repeated with some elaboration:

(1) *Factorial or multiple-variate design is more economical of time and of labor than is the single-variable plan, since several experimental factors may be studied simultaneously.* Furthermore, this design provides equal precision and demands no larger group of subjects than would be required if each experimental factor were studied alone. In Crutchfield's study 243 animals gave an appraisal of the 5 experimental factors, each at 3 levels, with as much accuracy as would have been obtained if 243 animals had been used to evaluate *each* factor singly, the other 4 factors being experimentally controlled. This means that 243 ×5 or 1215 animals would have been needed under the single-variable design to get a result obtained from 243 animals under factorial design.

(2) *Not only is there greater economy in factorial design, but such an experimental set-up is less artificial, and hence provides a more valid measure of the effects of each factor than does the single-variable method.* In the latter plan, results are valid only under the controlled conditions set up by the experiment. What effect a variable would have had under less restricted and more natural conditions, the experiment cannot tell. When several factors are controlled simultaneously or are held constant, conclusions relating to an experimental factor must be restricted to the given (and perhaps artificial) situation. In the illustration of p. 235, for instance, under single-variable method *H* would be studied while *T* and *S* were controlled; then *T*, while *H* and *S* were controlled, and so on. But these "drives" normally occur together and at various strengths. Factorial design provides (as here) a result valid over a wider range of conditions; single-variable design, on the other hand, provides only simple curves of performance at the different levels of the experimental factor.

(3) *Finally, factorial design supplies a means of studying the interactions or joint effects of the various factors.* These interactions may often be more important than the main effects. Also, the estimate of experimental error is usually more adequate in the factorial set-up, since the influence of possibly contributing factors is controlled through a segregation of the variance attributable to these causes.

Factorial or multiple-variable designs have application in a variety of psychological problems, such as the importance of various factors upon reaction time; of practice of different amounts and kinds upon transfer of training; of several variables at different strengths upon perception, memory, manual performance. In all of these, factorial methods, provide a broader base for generalization than can be obtained from single-variable methods. The main disadvantage of the factorial design is perhaps the complexity of the experimental situations when many variables at different strengths are to be investigated. Again, not as many levels of a

given factor can be tried out as is possible when only a single variable is studied at a time.

VI. The Applications of Analysis of Variance to Certain Special Problems

There are several applications of analysis of variance techniques to special problems which are important and useful enough to warrant special treatment.

1. *Reliability of mental tests.* The methods of variance analysis outlined in Section III are often useful in enabling an experimenter the better to evaluate a mental test or other measuring device. Suppose we have administered two forms (A and B) of the same test to 100 children in Grade V of an elementary school. Following the form of analysis given on p. 240 we may set up our data as shown in Table VII.

TABLE VII

Source of Variation	*DF*	*SS*	*MS (V)*
Between test forms	1	...	V_t
Between individuals	99	...	V_{ind}
Interaction (expl. error)	99	...	V_e
Total	199		

$F_1 = V_t/V_e$ $\qquad$ $F_2 = V_{\text{ind}}/V_e$

If F_1 is significant, then the performance of our subjects upon the two test forms is markedly different—due to practice or some other influence to be sought. If F_2 is significant, the test is a good measuring instrument, at least to the extent of separating individuals the one from the other. Should F_1 *not* be significant, practice and other effects have been negligible, and scores on the two forms are virtually equivalent. If F_2 is *not* significant, the test is clearly not differentiating the members of the group and hence is worthless.

In the study of a mental test, the analysis of variance may often be set up in another form more useful than that just presented. Thus the data in the problem outlined above might be arranged as follows:

TABLE VIII

Source of Variation	*DF*	*SS*	*MS (V)*
Between individuals	99	...	V_{ind}
Within individuals on the two forms	100	...	V_w
Total	199		

$F_3 = V_{\text{ind}}/V_w$

In this design the analysis of the total variance is into the V between individual subjects, for which there are 99 DF's, and within the scores of subjects on the two forms. Since each of the 100 subjects has two scores (one on Form A and one on Form B), the DF for "within" is 1 for each subject or 100 in all. Now if F_3 is not significant, the scores of individual subjects differ no more than do the scores made by the *same* individuals on the two forms of the test. Obviously, under these circumstances, the test is of no value. If F_3 is significant, the test is differentiating the members of the group.

From the V's in our table above, a statistic known as the *intraclass* correlation may be computed. Intraclass correlation differs from the usual "interclass" (product-moment) correlation. In interclass correlation, the variates X and Y fall into two columns and are distinct from each other: —r's between tests of intelligence and achievement, memory and reaction time are common examples. In intraclass correlation, there is no distinction between X and Y and the variables may be interchanged from one column to the other. The r's computed between the scores of twins in which either twin's score may be classified as X or as Y is an example of intraclass correlation. A method often used when variables are interchangeable is one in which each individual is classified first as X and then as Y, the r being computed from $2N$ cases. Other methods have also been devised (**19**).

In the design in Table VIII the intraclass correlation may be readily calculated from the formula,

$$r' = \frac{V_{\text{ind}} - V_w}{V_{\text{ind}} + V_w}.$$

When V_w is zero, *i.e.*, when the subjects' scores are identical on both forms of the test, $r' = 1.00$. A high positive r' indicates small variation within subjects' scores as compared to the variation between *different* subjects' scores on the two forms of the test. That is, each subject tends to score *alike* on the two forms, but individual subjects differ from each other. The intraclass r' is zero when the variation from subject to subject is no greater than is subject variability on the two forms. When this condition obtains, the same child is as unlike on Forms A and B as different children are unlike on the two forms.

The two attributes—consistency is subject score and differen-

tiation between subjects—are of course what one means by the reliability of a mental test. Hence, a high intraclass correlation gives more information regarding reliability than does a high interclass correlation. The latter (reliability coefficient or self-correlation), when high, tells us that the scores made by the *same* subjects on the two test forms are much alike *or* that they are different, but follow the same order. In the latter case, practice effects may cause the scores on the second test form to average 10 points higher, say, than on the first test. Consistency of score on the two occasions—in the sense of identity—is represented by an intraclass r' of 1.00, not by an interclass r of 1.00.

2. *Test for linearity of regression.* Analysis of variance may be readily utilized to test the linearity of regression in a correlation table. The test for linearity consists essentially in comparing the *V within arrays* (say within the Y-columns) with the *V around* the regression line, $\bar{y}=b_{yx}\cdot x$. If the regression line $\bar{y}=b_{yx}\cdot x$ passes through *all* of the column means, the difference between the sum of squares around the regression line and the sum of squares within columns is zero, and the regression is linear. The divergence of the sum of squares (within columns) from the sum of squares (regression lines) becomes greater as the regression departs more and more from linearity. When the departure is significant in terms of the F-test, the regression is nonlinear. Good examples and specimen calculations may be found in Lindquist (**26**) and Goulden (**18**).

3. *The standard error of an obtained score.* The usual formula for the standard error of an obtained score (sometimes called the standard error of measurement) is $\sigma_{1\infty}=\sigma_1\sqrt{1-r_{1I}}$ where σ_1, the σ of the first form of the test, is assumed to be equal to σ_2, the σ of the second test form. The coefficient, r_{1I}, is the reliability coefficient of the test. When an analysis of variance of the form given in Table VII has been made of the test scores, the standard error of an obtained score may be found directly by extracting the square root of the V attributable to "error." This residual V is what is left when the variance due to repetition of the test and to characteristic subject differences is removed. It is, therefore, a valid measure of an individual's divergence from his theoretical "true" score.

4. *Item selection and validation.* Analysis of variance offers a promising approach to the problem of the selection and validation of test items, although it may be doubted whether the items of

most psychological tests and questionnaries are worth the time and effort necessary to validate them by this technique.

Baker (1) has sketched a plan for evaluating the items of a test by the method described in Section III. Let us suppose that the test items under study are to be validated against a criterion made up of school marks, achievement test scores, or other general measures. Total scores on the criterion measure may be separated into several (*e.g.*, 5) subgroups, described as *superior*, *above average*, *average*, *below average*, and *inferior*. Baker suggests that these groups include 10, 15, 50, 15, and 10 per cent, respectively, of the criterion group; and other percentages may, of course, be employed. The items to be selected are now administered to the entire criterion group, which is then divided into subgroups selected to be as nearly comparable as possible. The percentage of each subgroup answering a given item correctly is computed. The experimental set-up is as follows:

		Criterion Subgroups				
		1	*2*	*3*	*4*	*5*
Experimental	I	.85	.75	.50	.35	.10
subgroups	II	—	—	—	—	—
selected to be	III	—	—	—	—	—
comparable	IV	—	—	—	—	—

To illustrate for item No. 74, the percentages of experimental group I answering this item correctly are 85, 75, 50, 35, and 10 per cent when distributed into criterion subgroups. This means that in the subgroupings of experimental group I, 85 per cent of those classified as "superior" by the criterion scores answered this item correctly; 75 per cent of those classified as "above average" by the criterion scores answered the item correctly, and so on. The experimental design for the 5 criterion subgroups and the 4 experimental groupings is as follows:

Source of variation	*DF*	*SS*	*MS(V)*
Between criterion classes	4	—	*V*(cols)
Between exper. groups	3	—	*V*(rows)
Interaction (error)	12	—	*V*(error)
Total	19		

From the *F*-test one can determine whether an item varies significantly in percentage from one criterion subgroup to another. The variance introduced by the differences in experimental groups is eliminated by the design.

Lev (24) has used analysis of variance between and within groups (Section II) as a means of determining the weights to be assigned to each of three possible answers to a questionnaire item. Weights were assigned in accordance with the extent to which the three answers reflected truly different attitudes. Lev's method was to find whether the mean total score of those subjects answering *often*, *sometimes*, and *never* to a given item was significantly different in terms of the "within" variance. The

use of analysis of variance in situations like this is legitimate and interesting; but it is doubtful whether it is very practical. Experience of others with weighting systems (**25**), (**40**) indicates that a rule-of-thumb will usually give final scores which are as valid as those theoretically more precise.

5. *R. A. Fisher's "discriminant function."* The nature and purpose of Fisher's discriminant function can best be made clear by an illustration. Suppose that we have administered a battery of tests to two vocational groups, to groups of boys and girls, to abnormals and normals, or to any two contrasted groups. How best can we weight the tests of our battery so as to provide a maximum separation or discrimination between our two groups? The equation which yields composite scores under the condition of optimum weighting constitutes a "discriminant function." Such a function is essentially a regression equation from which—once we know a subject's score on our tests—we can estimate his "best" composite score. When we possess scores in some criterion measure against which our tests may be correlated, the discriminant function becomes an ordinary multiple regression equation.

Applications of the discriminant function to psychological problems—with some description of the mathematical derivation will be found in papers by Travers (**42**), Wilmott (**45**) and Lorge (**27**). Fisher's own account of this method (**12**) (**14**) will probably be difficult for psychologists who do not possess considerable mathematical training.

VII. Analysis of Covariance

The questions which analysis of *covariance* attempts to answer are quite similar to those with which analysis of variance is concerned. The main distinction between analysis of variance and analysis of covariance is the fact that in analysis of variance we have only *one* basic variable to analyze while in the analysis of covariance there are at least two such variables and in some cases many more than two. Thus analysis of variance may be regarded as *univariate* analysis, while analysis of covariance may be regarded as *multivariate* analysis.*

* This distinction between univariate and multivariate analysis must not be confused with simple and multiple classification for analysis of variance. (See page 235.) Another way of distinguishing between analysis of variance and covariance is to note that when one of the classification criteria in an analysis of variance is a continuous variable that bears a significant correlation to the basic variable and to one of the classification criteria, the procedure to be used is analysis of covariance.

It will be of interest to examine the situations in which it is desirable to modify the experimental design so as to include an analysis of covariance. As long as the experimenter can arrange the classification criteria at will and select at random individuals from each class, a simple analysis of variance is satisfactory. An analysis of covariance must be resorted to when a second variable, which is correlated with the basis variable under examination, shows a significant degree of association to one or more of the classification criteria. Thus, suppose we wish to determine whether there are any geographic or regional differences in the weights of children. The simplest approach would consist of dividing the total weight variance into two parts: *between regions* and *within regions* and then determine the F ratio for these two variances. Before concluding that weight is related to geographic location, we must determine whether age is a factor in this relationship. Age may be regarded as another classification criterion, and a two-way table can be drawn up in which weight is distributed according to the several subclasses of age in each geographic region. This gives rise to a two-way analysis in which the total weight variance is divided into three parts; between regions, between age groups and the residue which is independent of interregional and interage effects. The F ratio between the interregion and residual variance would then tell us whether or not there are regional differences in weight which are independent of the influence of age. This procedure is entirely valid if the age distribution is uniform in all the regions. But if age, like weight, also shows regional variation, and furthermore, if age is correlated with weight, the simple analysis of variance method does not apply and an analysis of covariance must be resorted to.

The simplest example of the analysis of covariance, and one especially useful in psychology, is the case in which the gains from initial to final performances in a given task are compared for two contrasted groups. Ordinarily, the gains in one group are compared with the gains in the second group by means of the critical ratio method. The method of simple analysis of variance could be utilized for this case. Such a procedure will answer the question as to whether or not the gain was related to the differential factor on the basis of which the two groups were selected or contrasted. But this answer will not be conclusive, because the difference in gain between the two groups may in part be due to whatever differences exist in the initial levels of the two groups.* In order

to be certain that the difference between the two groups in their respective gains is not influenced by the initial level of the groups, some way must be found to eliminate the influence of initial level from the gain.

The common practice utilized previous to the introduction of analysis of covariance was to use the regression equation between initial and final performances. By subtracting from the final performance of each individual the amount which was predictable from his initial performance, the residue independent of the initial level was obtained. These residuals could then be compared for the two contrasted groups, and the mean difference in residuals compared with the standard error of this mean difference.

This procedure of dividing the variance of one variable into two parts: (1) a part that is directly predictable from a second variable, and (2) a part that is independent of the second variable, is the essence of the method of analysis of covariance. It differs from the procedure just described in several essential points, but the underlying principle is the same.

The advantages that the analysis of covariance has over the older practice are: (1) it permits an over-all analysis when more than two groups are contrasted and (2) it permits a finer analysis in so far as it makes possible an examination of not only the total correlation and regression coefficients but also of the intergroup and intragroup coefficients. A simple example will illustrate the method.

In an experiment on the effect of convulsive electric shock on the memory of patients,** a series of tests consisting of paired word associates were taught before and after shock and the results compared with control data when no shock intervened.

The data are shown in Table IX.

Although an attempt was made to equate the tests for difficulty, this attempt did not prove successful. It is, therefore, important to remove the effect of initial difficulty from the final gain or loss in relearning. Table X gives the number of errors for tests under control and experimental conditions. Instead of predicting each relearning score from its initial learning score, it is

* It is well known that the correlation between gain and initial score is rarely zero. The exact relationship is given by $r_{x(x-y)} = (1 - kr_{xy})/\sqrt{(1+k^2-2kr_{xy})}$ and this will vanish only when $r_{xy} = 1/k$, where $k = \sigma_y/\sigma_x$.

** These data were obtained from a series of mental patients treated with electric shock (**48**). Only selected data are presented to make the computation simpler.

TABLE IX

NUMBER OF ERRORS MADE IN LEARNING AND RELEARNING BY PATIENT *P* UNDER CONTROL AND UNDER EXPERIMENTAL CONDITIONS

Control			*Experimental*		
Series	*Learning* (x)	*Relearning* (y)	*Series*	*Learning* (x)	*Relearning* (y)
A	3	0	*G*	11	19
C	8	13	*K*	9	19
E	8	2	*M*	9	21
			L	39	31
Sums	19	15		68	90
Sums of squares	137	173		1804	2124
Sums of products	120			1778	

simpler to utilize a method which is in essence equivalent but which involves less computation (**26**). The only new type of sum introduced is the cross product. The sum of squares of the deviations are obtained in the usual way (**37**), and the correction factor which reduces the cross product to its deviation form is $[\sum(x)\sum(y)]/N$. These corrections are applied to reduce the sum of squares and products to deviation form. The results are shown in Table X.

TABLE X

SUMS OF SQUARES AND PRODUCTS FOR DATA IN TABLE IX. MEASURES ARE EXPRESSED AS DEVIATIONS FROM THEIR RESPECTIVE MEANS

Source	*Learning* (x)	*Relearning* (y)	*Cross Product* (xy)
Control	16.7	98.0	25.0
Experimental	648.0	99.0	248.0
Intra-Conditions Total	664.7	197.0	273.0
Inter-Conditions	195.1	525.0	320.0
Total	859.8	722.0	593.0

In order to analyze the data presented in Table X, it is necessary to recast it into two parts: the *inter*-condition variance, which gives the effect of the contrast in experimental conditions (control and shock); and the remaining or *intra*-condition variance, which gives the variability to be expected when all the learning and relearning are done under constant conditions. The within variance is obtained by squaring the deviation of each score, deviations in the two groups being taken from their respective means. The sum of squares for within conditions is shown in line three of Table X. The difference between the total and the within conditions sum of squares is equal to the between conditions sum of squares as shown in line four of Table X. These data have been rearranged

in Table XI to show the sums of squares and products for the two sources of variation (inter- and intra-conditions) divided by respective degrees of freedom.

TABLE XI

SUMS OF SQUARES AND PRODUCTS FOR DEVIATIONS FROM THE MEANS CORRESPONDING TO THE DATA IN TABLE X

Source	*DF*	*Learning Variance*	*Relearning Variance*	r_{xy}	b_{yx}	*Adjusted Sum of Squares for Relearning*	*DF*	*Adjusted Variance for Relearning*
Inter-Condition	1	195.1	525.0			295.4	1	295.4
Intra-Condition	5	132.9	39.4	.75	.41	84.6	4	21.1
Total	6			.92	.69	380.0	5	76.0
F (inter/intra)		1.5	13.3					14.0

In addition to the mean sums of squares and of products, Table XI also shows the correlation coefficients and regression coefficients for the intra-condition data and for the total data. The correlation is given by the equation:

$$r_{xy} = \sum(xy)/\sqrt{\sum(x)^2\sum(y)^2}$$

and the regression coefficient by the equation: $b_{yx} = \sum(xy)/\sum(x)^2$. (Data in Table X.)

There are three possible correlation coefficients and corresponding regression coefficients that could be calculated from Table X: (1) from the *inter*-condition data; (2) from the *intra*-condition data and (3) from the total. Since the inter-condition data reflect the influence of the experimental factor, it would be incorrect to utilize the coefficient from this source in estimating the intrinsic relationship between initial and final scores. The intra-condition correlation is suitable for this purpose, however, since it is free of any *systematic* effects of the experimental factor.* When the intra-condition regression coefficient was applied to the intra-condition and inter-condition sum of squares, the adjusted sum of squares (from which the influence of the initial level is eliminated) was 84.6 and 295.4 respectively. Similarly, when the intra-condition regression coefficient was applied to the total sum of squares the total adjusted sum of squares was found to be 380.0.** The differ-

* The total data cannot be used to determine the regression because these data include the effect of the inter-condition differences.

** The methods for performing this reduction ore given by Snedecor (37).

TABLE XII

ANALYSIS OF COVARIANCE FOR EFFECT OF SHOCK UPON MEMORY UNDER 4 EXPERIMENTAL CONDITIONS

Source	DF	Learning (x)		Relearning (y)		Cross Product	r_{xy}	b_{yx}	Unregressed or Adjusted		Regressed		Adjusted Variance
		Sum of Squares	Variance	Sum of Squares	Variance				Sum of Squares	DF	Sum of Squares	DF	
Inter-Condition	3	1293.6	431.2	1384.5	461.5	1132.1	.85	.88	393.7	2	990.8	1	196.9
Intra-Condition	15	1111.6	74.1	1244.5	83.0	698.7	.59	.63	805.3	14	439.2	1	57.5
Inter-Regression									36.4	1			36.4
Total	18	2405.2		2629.0		1830.8	.73	.76	1235.4	17	1393.6	1	72.7
$F = \frac{\text{inter-condition}}{\text{intra-condition}}$			5.8*		5.6*								3.4†

* F ratio significant.
† F ratio nonsignificant.

ence (342.0) between the unadjusted sum of squares for relearning (722.0) and the adjusted sum of squares (380.0) indicates the degree to which the initial level of learning controls the relearning variance. In assigning degrees of freedom to each source of variation, the usual procedure is followed of allowing one less than the number of independent measures in each category. It should be noted, however, that for the intra-condition sum of squares the difference between the adjusted and unadjusted (the regression effect) for relearning must have one degree of freedom assigned to it. Consequently, the 5 degrees of freedom that belong to the intra-condition sum of squares are distributed by giving 4 for the adjusted and 1 for the unadjusted sum of squares.

The first question to be investigated is: does the initial level of learning exert a sufficiently strong influence on the relearning level to require the adjusting provided by analysis of covariance? Let us examine the intra-condition variance. The unadjusted sum of squares of relearning from this source is 197.0 (Table X), and the adjusted sum of squares is 84.6 (Table XI), indicating that the adjustment has reduced the sum of squares by 112.4. The degrees of freedom corresponding to the unregressed* and regressed sum of squares are 4 and 1 respectively. Dividing the sums of squares by their respective degrees of freedom, we obtain the variances—21.1 and 112.4 for the unregressed and regressed variances. Dividing the latter by the former we obtain an F-ratio of 5.3, which for 4 and 1 degrees of freedom has a P value somewhat higher than .05. Consequently it is doubtful whether the initial level exerts a strong enough influence on the relearning level to affect the results. Usually one would drop the analysis at this point, but for the sake of finishing the illustration it will be carried out to its completion.

The second question to be answered is: does the removal of the influence of initial level produce any differences in the relationships between the two contrasted conditions for relearning? Let us first examine the unadjusted results.

When the unadjusted inter-condition variances are compared to the intra-condition variances, the F-ratios for the learning variances are not significant, but for relearning an almost significant

* That portion of the final variance which is predictable from the initial level is called the regressed variance, while the residue which is not predictable from the initial level is called the unregressed variance. The unregressed variance is identical with the adjusted variance.

ratio of 13 is obtained, indicating that the control mean probably differed significantly from the experimental mean in relearning. When the influence of initial learning is ruled out, the resulting *F*-ratio given by the adjusted variances is increased to 14, which is still in the doubtful zone of significance. Thus, the partialling out of the initial level does not materially change the significance of the comparisons.

So far we have dealt with a case involving simple analysis. Such cases can be treated as well by the ordinary methods of regression and group comparisons as by analysis of covariance, and the only innovation is the possibility of treating inter-group regression as well as intra-group regression.*

The power of the covariance method becomes clearer when there are more than two subclasses in the classification. The data previously presented in Table X were obtained from an experiment in which, in addition to the control and shock data, there were also inter-shock and post-shock data. These data are shown in Table XII. It will be noted that although the difference between the means of errors for the several experimental conditions was significant for the learning and relearning situations respectively, these differences disappear for relearning when the initial learning score (number of errors) is partialled out.

In Table XII each sum of squares for both sources of variation, the inter-condition and intra-condition, were adjusted by their own regression coefficients. The total sum of squares was also adjusted by its own regression coefficient. The adjusted or unregressed sum of squares as well as the regressed sums of squares are shown side by side for each source of variation. The *F*-ratio of regressed to unregressed variance is significant for the intra-condition source and for the total, indicating that the learning level exerts a significant influence on the relearning level.

One complicating element should be pointed out here regarding the problem of dealing with the three possible types of regression coefficients that could be utilized in adjusting the relearning means.** When the total of the adjusted sums of squares for the

* It will be readily noted that the inter-condition regression (or correlation) was previously regarded as "spurious correlation" due to heterogeneity of material. Yule (47). When two groups whose means are different are placed together in the same correlation chart, the resulting correlation will be spuriously high because of the heterogeneity that exists between the two groups.

** Although there are three possible correlation coefficients—inter, intra, and

two conditions was computed, it was found that it fell short by 36.4 of the amount computed by the total regression coefficient method. This amount of variation represents the variability that exists between the two regression coefficients and can be treated as another source of variation. Sometimes a question arises as to whether the intra-condition regression coefficient should be utilized to adjust the inter-condition and total, or whether each variance should be adjusted by its own regression coefficient (**22**). No general rule can be laid down, but it is advisable to utilize only one regression coefficient, because in that way only one degree of freedom is used up. Ordinarily, the regression coefficient for the total is to be preferred in such cases, since it is based on a larger number of degrees of freedom. However, if there is a significant inter-regression variance, it must be analyzed into its proper components.

Since in the present case the inter-regression variance was found to be only 36.4, which is even smaller than the intra-condition variance, it is possible to consider the inter-condition regression coefficient as not different from the intra-condition regression coefficient, and compute the residual variance accordingly. However, whether we utilize only one regression coefficient or both seems to make little difference in this problem, as the F-ratio still turns out to be nonsignificant.

Complexity is often introduced when more than one classification criterion is utilized. Thus, the data described above were obtained from several individuals. The total variance over all the conditions and all the individuals was analyzed not only for the inter-condition but also for the inter-individual effect.

A still further source of complication is that due to the introduction of additional variables. For example, besides the learning and relearning measures, there were also available recall* measures and recognition** measures on each of the tests. All of these additions are covered by easy extensions of the basic procedure of analysis of covariance, by means of which the variance of one variable over a series of subgroups can be analyzed after the influence of the correlated variables is eliminated.

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total—only two of them are independent, since the total coefficient can be obtained from the combination of inter-and intra-condition coefficients.

* The recall is measured by the first trial in relearning.

** After the entire series was completed, a recognition test was given in multiple choice forms.

Examples of the analysis of covariance are even less frequent in psychological literature than are examples of analysis of variance. One of the earliest illustrations of the covariance technique was in connection with the scoring of tests of perseveration (**4**). This personality trait is usually measured by noting the decrease in speed of a given performance, *e.g.*, making horizontal tallies, when the directions are alternated between making horizontal and vertical tallies. The drop in speed indicates the perseveration of the preceding tendency. Usually the absolute difference between the control and experimentally altered speeds is taken as a measure of perseveration. It is apparent, however, that absolute difference will not be comparable from individual to individual because it depends on the normal level of speed in the function being measured. In some instances the ratio of this difference to the control speed is utilized in the hope that percentage differences in speed will be comparable from individual to individual. Rangachar (**29**) suggested that the best measure of perseveration is obtained by taking the difference between the observed experimental speed and the speed predicted from the control level. This is a direct application of the covariance technique.

Another instance in which the covariance technique might be useful is in connection with learning experiments involving control and experimental conditions when several measures of performance are available, such as trials, errors, and time. Instead of resorting to *a priori* weighting of these measures to obtain a total score, one of them (any one) can be selected as the index, and the observed measure compared with the measure predicted from the control levels in all three factors. The discrepancy between observed and predicted scores indicates the influence of the experimental factor.

Snedecor (**38**) has applied this technique to the problem of determining the homogeneity of teachers' marks. Struck by the difference between classes in their average attainment in mathematics, he set out to determine whether these differences reflect variation in mathematical ability or whether they reflect differences in teachers' judgments. It may be expected that the abler students will tend to have higher marks than the less able. Consequently, differences in marks between classes might well be laid to the influence of differences in initial ability. The two variables concerned were initial ability as determined by three preliminary tests, and the final mark in a mathematics course. Snedecor utilized the analysis of covariance technique to partial out the influence of initial level and discovered that differences between the classes still persist but are not nearly so marked as are the uncorrected differences. In short, the observed differences are due largely (but not entirely) to initial differences in ability and they are, in part at least, due also to differences in teachers' judgments.

Gaskill and Cox (**17**) have applied the method of analysis of covariance to studies of the influence of emotion on respiration. They investigated two variables: (1) the frequency of breathing (number of respirations per second), and (2) the number of atypical breaths per period under four experimental conditions. These were: (a) rest, (b) story read with abrupt and surprising ending, (c) crucial fear stimuli presented, and (d)

projection of various types of moving picture films. The problem may be stated as follows: "We want to know if the frequency of breathing has an influence upon the number of atypical breaths. If so, is the relationship the same under various emotional conditions?" It was found that the correlation between the two factors, frequency of breathing and number of atypical breaths, was only .003 for the entire set of experiments, but it varied considerably from experiment to experiment. The variance of the number of atypical breaths per period was analyzed after eliminating its relationship to the frequency of breaths. The adjusted variances showed a significant result for the inter-regression effect and for the inter-condition effect. Apparently each experiment produces a different effect on the number of atypical breaths even when frequency of breaths is kept constant.

The techniques of variance and covariance are applicable not only to experimentally controlled laboratory data such as those described previously, but they may also be applied under certain conditions to data over which the experimenter does not have complete control. One example of this is the twin study in which the experimental factors are predetermined and the task of the experimenter is observation rather than manipulation of experimental factors.

For example, Jackson (**21**) analyzed Wingfield's (**46**) data on resemblance of fraternal twins (unlike-sex pairs) in intelligence. In order to remove the differential effect of chronological age, the mental age scores were adjusted for chronological age. Results indicated that when the influence of chronological age is removed, the between-pair variance in mental age is no greater than the within-pair variance for pairs of twins of the same age. Therefore, the differences between twins are no greater than are the differences within twin pairs.

Several related or cognate methods, utilized frequently, must be clearly differentiated from analysis of variance and covariance. If scores on two forms of a test are available for each individual in two contrasted groups, two possible questions may be put to the data. The first concerns itself with the reliability of the test as a whole and its differential reliability in the two contrasted groups. The second concerns itself with discovering whether the gain from the first to the second test is different in the two contrasted groups. The first of these problems is a simple analysis of variance problem (p. 235) while the second calls for an analysis of covariance. Thus, the same data can be treated in different ways depending upon the purpose of the experiment.

A sharp distinction should be drawn between factorial analysis as carried on through the technique of analysis of variance and

covariance, and factor analysis as carried on through techniques which deal with correlational matrixes. Both of these procedures attempt to resolve a total variance into its components. The simplest distinction to be noted is that in analysis of variance, only one variable enters and is distributed according to various independent criteria; and the purpose of the analysis is to see how each independent classification criterion is related to the basic variable. In factor analysis, on the other hand, there are always several mutually dependent variables, and the purpose of the analysis is to determine underlying independent components that may reproduce the observed intercorrelations. Thus, the two methods are in a sense diametrically opposed, the first *beginning* with independent classification criteria, and the latter *ending* with independent factors. Since analysis of covariance reduces to analysis of variance in which several factors are held constant, the above statement holds equally true of covariance analysis. If we suspect that several factors may influence the outcome of a given experiment and can identify these factors beforehand, we can determine by means of analysis of variance whether the several factors actually influence the outcome. We can also determine whether a given combination of these factors has a differential effect (interaction) on the outcome. This situation is one which usually occurs in the laboratory where we can manipulate our factors to suit the experimental demands. When we do not know the factors that influence the outcome of an experiment, or when we know them but cannot control them experimentally, we can resort to factor analysis. Such situations are found in new research areas where little previous work has been done and there are many interrelated variables present. It is simpler in such cases to classify these variables into coherent groups by means of factor analysis, and in this way get some insight into the network of underlying relationships. Another way of distinguishing between the two techniques is to note that factor analysis deals with the differences between sets of tests for a given group of individuals, while variance analysis deals with differences in our tests between groups of individuals classified according to different sets of classification criteria.

We may close our discussion by summarizing those requirements which our data must satisfy before analysis of variance and covariance are suitable procedures. *First*, the individual measures or cases that fall into each category of the classification criteria

must be unselected. In order to determine whether any selection has taken place, the variances of each row and each column in the classification criteria must be approximately equal and whatever differences are found to exist should be attributable to random variation. *Secondly*, distributions obtained from several individuals, in which each individual's score enters more than once, should *not* be treated as independent data, since the scores of the same individuals are usually correlated. Variability within such data must be separated into two parts: inter-individual and intra-individual variance. *Thirdly*, the classification criteria must be independent. For example, if intelligence test data are classified by race and by region, the resulting table will not be amenable directly to the analysis of variance techniques because there is definite association between the proportion of Negroes and regional distribution of the population. An estimation of error derived from such analysis will be swelled by this correlation and any conclusion based on the analysis, although erring on the conservative side will not lead to conclusive results. *Fourthly*, the basic variable under examination must have a normal distribution in the population from which the sample is drawn. *Fifthly*, for analysis of covariance, the correlations must be linear.

The extent to which deviation from these requirements affects the results of the analysis have been examined by Pearson (**28**), who concluded that even when some of the above requirements are not rigorously adhered to, the results of the analysis may still be meaningful. The degree of deviation from the prescribed requirements which would nullify the conclusion based on the analysis is still to be determined.

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PSYCHOLOGY AND THE WAR

Edited by

STEUART HENDERSON BRITT

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PERSONNEL RESEARCH IN THE ARMY
III. SOME FACTORS AFFECTING RESEARCH IN THE ARMY

BY STAFF, PERSONNEL RESEARCH SECTION, CLASSIFICATION AND REPLACEMENT BRANCH*

The Adjutant General's Office

Personnel research in the Army, like that in any specialized field, has its own special characteristics. Military organizations and conditions differ markedly from civilian groups and situations; consequently the methods used in any military activity are subject to factors affecting to a marked degree the work which is done. These factors operate in two ways: by creating possibilities generally not found in personnel research and by imposing limitations which must be taken into consideration in every undertaking. The purpose of this article is to afford some insight into the framework within which studues are conducted, including both possibilities and limitations. This furnishes a background for understanding better the reports of specific studies carried on by the Personnel Research Section to be reported subsequently.

In spite of the great advances made in military personnel practices during the last war, it can hardly be said that any well-defined body of content or procedures existed when the present war began. Little scientific work in Army testing was done between the two wars, whereas other aspects of the field of applied psychology advanced conspicuously. This made it impossible to begin where Army personnel work had stopped in 1918. The progress made during the last war and advances made in related fields since were used as the basis for beginning to study the new personnel problems of this war. Leaning heavily on recent developments in psychology, the Personnel Research Section has adapted those which are applicable to the new situation. A new group of workers has had to become familiar with military practices, for the Army

* The title of the Branch has been changed during the past month from Classification and Enlisted Replacement Branch since it has been given responsibility for the replacement of officers as well as of enlisted men.

did not employ any psychologists until the enlargement of our armed forces began in 1940. The fact that testing and classification work are now combined in The Adjutant General's Office has made possible a more integrated approach to Army personnel problems, and a new phase of applied psychology is being intensively developed.

The Personnel Research Section came into being because it was essential to the winning of the war. It was not set up to carry on research for its own sake. Rather, research is carried on as a service to the War Department, and every problem that is studied is born of a real and urgent need. Only those problems directly related to the war effort can be investigated. This vitalizes the entire program. Freedom and human lives, not theories, are at stake. The reality of the problems, the necessity for action, the consequences that are involved, the magnitude of the enterprise, all give quality to the work that cannot be dissociated from the results obtained. In the following sections are discussed some of the problems affecting personnel research in the Army.

Size of the Army. The most obvious influencing factor is that of sheer size. The Army is engaged in the largest personnel program in the history of the country, perhaps of the world, and size brings its own peculiar type of possibilities and difficulties. A partial idea of the Army's size, and its attendant problems, may be gained from imagining the situation that would result if all the colleges and universities in the country were brought under one centralized administrative head. Even then, the resulting organization would be less than one-third as large as the Army will be at its maximum. In addition, the personnel policies in a university affect the lives of students to only a fraction of the extent that the Army's personnel policies affect the lives of soldiers.

To speak of the sample on which research is being conducted in the Army is hardly accurate. It would be more proper to refer to it as a population, for with few exceptions data are being collected on all males between the ages of 18 and 38 eligible for military service. The number will be far greater than in the last war. In 1917–18 the Army attained a size of only about three million in comparison to the seven or eight million man Army now being built. Furthermore, data will be available on all the men that are being inducted now. In contrast, during the last war data were available on less than half the men, since the psychological measures were not ready for administration until long after our country

had entered the conflict. Number, in and of itself, means little but it has certain advantages. It makes possible an accurate check on the reliability of all the measures which are devised and permits the comparison of men from varying geographical areas to a degree never before possible. It has also necessitated the development of personnel procedures adapted to large groups which may serve many useful purposes in the future. A by-product of the size of the Army is the fact that at any one time large samples of almost any description are available. For example, there are always a large number of men being inducted, another group finishing basic training, another beginning officer training. Data with reference to a particular measure can thus be collected with great speed, and the results of any research can be put into practice with the same rapidity.

With the formation of the Women's Army Auxiliary Corps, data are also being collected on women. Thus an entirely new area of research is being opened. The number of women which it is planned to induct into the Auxiliary Corps indicates that the size of the sample should be adequate for obtaining significant results.

Diversity of Problems. The highly specialized nature of the present war has necessitated research on a variety of problems perhaps never before equalled in one organization. In this respect the size of the Army has been a definite spur to the construction of precise measuring instruments. Correct placement has become an urgent necessity in order that an organization the size of the Army can function at its necessary efficiency.

Mention of a few of the problems will give some indication of their diversity and scope. The fundamental job was the construction of tests to give an index of ability to learn, for general classification of all men inducted into the Army. The Army General Classification Test now serves that purpose. For those men who neither speak nor write English or who are illiterate, a Visual Classification Test was devised.

The many specialized jobs necessary in the Army have led to the construction of tests in a variety of different fields, such as those for radiotelegraph operators and truck drivers. In order that men with trade backgrounds can be correctly selected and placed, and given the training they need, trade knowledge and aptitude tests have been devised. For various occupations, educational achievement tests were necessary. The selection of officer candidates has brought about research on leadership and a large number

of tests have been built for the selection of warrant officers. Interrelated with the construction of tests is the work on occupational analysis, carried on as part of the duties of the Classification and Replacement Branch. Military occupations in all arms and services are analyzed, and data are calculated and kept on the occurrences of and requirements for all military specialists.

Time Available. The pressure of time pervades every problem and solution. This has often been called a war against time as much as against the enemy. Time saved—or lost—is measurable in terms of human life and national security, rather than as educational or industrial efficiency. All training programs are tightly planned. Every moment is given over to teaching enlisted men and officers knowledge and skills which will be of use in combat. There is no time allotted to research as such, and each interruption for the purpose of collecting data breaks into the schedule far more seriously than it would in education or industry. Taking a morning or an afternoon for the administration of a test dislocates the training program. It may mean that the soldiers in that group miss instruction of considerable importance. Because of this, the administration of tests not called for in the regular routine generally takes place in the evening after the day's duties are done.

Chemical and physical research differ from personnel experimentation and research in that they can proceed largely without disrupting training schedules. In personnel studies large amounts of soldiers' time are necessarily involved, and time is of first importance. There are situations in which even a few hours taken from a training program to collect data not immediately useful to the training officer may appear to be time ill-spent when viewed only in terms of the situation at hand. The proper authorities must be convinced that the present sacrifice will pay dividends in the near future. In research programs carried on over a long period of time, such difficulties are multiplied. However, these are not insurmountable. Data for the study of any problem can always be collected even though training programs are interrupted. This is, however, a factor that must be taken into consideration in the gathering of data.

Army Organization. For purposes of research, military organization has many advantages. The uniformity which exists in Army installations makes possible the collection of comparable data from many sources. Once the necessity for obtaining certain

data is apparent, a directive sent to the field is assured of compliance. One can be certain that the same records are kept on a soldier in Maine as on one in Montana, and that information on both is equally accessible.

A complete record of the Army experience of every soldier is kept on the Qualification Card. All test scores, course grades, and assignments are recorded. In addition, considerable material on a man's civilian experience is collected when he is inducted. A wealth of data is thus available for every subject in a study, making possible the investigation of relationships seldom possible in other situations.

Selecting and Maintaining Samples. The system of quotas that exists in the Army has a direct effect on the quality of the samples in studies. Based on the needs of the various arms and services, quotas are set up over certain periods. It may be that because of imminent military operations a large number of men will be needed in the Engineer Corps. When that is the case, the quota is filled from the men who are then being inducted. Naturally, because of this system, some misplacements result. This may mean only that a man is placed in the field of his second rather than his first choice, and reassignment of men incorrectly placed is made during the first few months of training. The assignment of men where needed is, however, an understandable military necessity. Within the number of men referred to above who are classified for training in the Engineer Corps, certain other quotas are set; that is, a specified number must be trained as officers and others must be trained as specialists (in demolition, bridge building, etc.) to provide the skills needed in the projected operations. If the quotas for the Engineer Corps are high over a period of time, the average caliber of the men assigned to the engineers will probably drop; and, when men already in the Corps are assigned to specialist training, it is likely that as quotas are increased more men of low ability will have to be selected for that training. Thus, the populations of two groups in the same type of training may be quite different.

As can be gathered from the above, there is frequently a conflict between the quality of men wanted for a certain type of training or position and the men who are available. In such cases a sacrifice of one or the other is made. Either men of lower aptitude are accepted and given all the training possible in the available time, or fewer men are taken than originally requested and no change made in the training standards. In general, only men in

officers in the field have trained their own staffs. The quality of the field personnel is generally of high caliber, and they are doing effective and efficient work.

Summary

Procedures in Army personnel research are determined by several factors, unique to the Army, which both open possibilities and impose limitations: the size of the Army, the wide variety of problems on which research is being carried forward, the pressure of time, Army organization, selecting and maintaining samples, determining validity criteria, and the building up and training of a competent field staff. A knowledge of these factors and how they operate is essential to an understanding of how personnel work is conducted in the Army and also of the results that are obtained.

THE SPECIAL TRAINING UNITS OF THE ARMY

BY MORTON A. SEIDENFELD
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Generally when one thinks about training in the Army, there are visualized columns of men in uniform, drilling with rifles or smartly marching down the field with heads held high and feet sharply stamping out cadence with staccato clarity. Such a mental picture is oftentimes correct; yet to be completely accurate it should include an occasional man who just cannot keep in step, who does not know "right" from "left," or one who marches with a decided limp.

Within the military services there are a sizeable number of men who are moderately physically handicapped, some who are on the dull side mentally, and still others whose learning is retarded due to lack of acquaintance with the English language. Such men, however, are capable of giving a great deal of useful military service provided they are trained to execute the duties assigned to them. This means that each man in these categories must be given some specialized form of training prior to, or concurrent with, their regular military instruction. Obviously such training requires more time than normally allocated to basic military instruction within the Army. This additional time for training and the special program of instruction is provided by the establishment of an educational program designed specifically for Special Training Units. Men assigned to such units, in addition and prior to regular training, take from eight to thirteen weeks special training during which half-time is devoted to academic instruction in the fundamental subjects of reading, writing, and arithmetic, and the remaining half to instruction in the basic military subjects.

In the case of men who are assigned to Special Training Units as a result of physical deficiencies only, the program of training is based upon the concept of teaching the man how to overcome his handicaps. Many men are able to perform "general service" in spite of physical limitations; others, however, are able to perform only a portion of the duties of a soldier, and are assigned to "limited

service." If a man cannot accomplish his duties at first, he is given necessary stamina-building exercises so that he can successfully meet such situations as may ordinarily be encountered in the assignments for which he is considered physically qualified. Such a program is in actuality a buffer, affording the man adjusted to his civilian environment an opportunity to make the transition to military life without breaking his morale.

Similarly, but using techniques appropriate to the problems involved, men who are in the slow learner group (mentally dull) are provided not only with the opportunity to be trained under conditions that are pitched at their capacity to acquire knowledge, but they are also given instruction by personnel who are especially qualified to teach men in this category.

Those who are in the foreign-language group, who cannot read or write English to a degree which will satisfy Army requirements, are likewise taught the fundamentals of the language within the Special Training Unit.

To accomplish this program, the War Department has developed textbooks and instructional materials, including teachers' guides and visual aids necessary to assist instructors. The Section of the Adjutant General's Office concerned with adult elementary education in the military services is carrying on research to develop effective and rapid techniques. With training time relatively brief, all methods are pointed toward establishing maximum efficiency in the learning process. The materials developed place particular emphasis on motivating the learner toward an eagerness to learn all he can as rapidly as possible. His academic learning is designed to tie in well with his military training so there will be no lost motion in carrying him from these subjects into the task of learning to be a soldier.

The instructional staff at the various military installations having Special Training Units is composed of both officers and enlisted men. A very large proportion of this personnel has a background of training in the field of Education augmented by teaching experience. Unfortunately, the problem is so large in scope that it has been difficult to secure a sufficient number of teachers with special training and experience. Many qualified teachers are actively engaged in carrying on other instructional activities and cannot be assigned to this work. Accordingly a course of instruction on Methods of Teaching in Special Training Units is now being

prepared for the field by The Army Institute, and a school is contemplated for teacher training of instructors in these units.

The staff of officers and professional civilian personnel dealing with Special Training Units within the War Department has produced a great deal of original instructional material in the form of textbooks, film strips, periodicals, and current event leaflets, as well as aids and guides for instructors. These materials are characterized largely by their freedom from rigid and static content. Every effort has been made to maintain an eclectic attitude so that teacher and student alike will be provided with ample opportunity to teach and learn in a manner most effective to their individual backgrounds. Much emphasis has been placed upon visual aids as a valuable auxiliary in training; auditory, visual, and kinaesthetic sensory mechanisms are used to the fullest extent to augment each other and to assure the learner of means that will be adapted to his particular learning pattern. Such an approach is essential in view of the limitations on the amount of time available for training. The evidence indicates that with present techniques about 95 per cent of all the men sent to special training successfully complete their instruction and go on to regular training.

Through the special training program, many thousands of men have already been made more useful in the Army; in fact, many men would have had to be discharged had it not been possible to bring them up to an acceptable training level through the efforts of officers and men carrying on this program in the field.

THE MILITARY USE OF THE RAIL-WALKING TEST AS AN INDEX OF LOCOMOTOR COORDINATION

BY S. ROY HEATH, JR.

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Good muscular coordination is readily recognized among military men as a prerequisite for soldiers selected for tactical duty. The success with which the Rail-walking Test (1) scores discriminate between groups approved for tactical duty and those not approved reenforces the validity of the test as an index of locomotor coordination. If a soldier fails to react smoothly and quickly in his physical movements, his presence as a member of a tactical team will be costly for both manpower and materiel. The poorly coordinated are better used for duty in the non-tactical sphere where less precision and speed of movement are required. Intelligence and emotional stability are also differentiating factors but motor coordination remains one of the most critical.

The Rail-walking Test consists of walking three wooden rails 9 feet by 4 inches, 9 feet by 2 inches, and 6 feet by 1 inch, of sufficient height to prevent contact of foot with floor. Each rail is graded in units of feet and is walked barefooted heel to toe by the subject three times. The raw score is the total number of feet walked without falling off. Because of the difference in degree of difficulty of each rail the raw score for the three rails is weighted in a 1–2–4 ratio. Thus, the total possible score is (1×27) plus (2×27) plus (4×18), or 153 points. The test was standardized on 1,013 troops selected from a non-special unit which could be regarded as an average cross section of the white male population of Army age. The mean Rail-walking score for this group was 130.73 points with a standard deviation of 19.63 points.

Seventy-three soldiers selected at random from a group (not included in the normal standardization) who after initial training were classified by the Army as "able to meet the minimum standards for tactical units" were tested on the Rail-walking Test. The mean score for this group was 134.41 points with a standard deviation of 13.70 points. No score was below 94 points. Next 94 soldiers, selected at random, were tested from a group which was composed

entirely of men found unsuitable by the Army for duty in tactical situations. The mean Rail-walking score was 86.06 points with a standard deviation of 32.80 points. Fifty-three cases, or more than 50 per cent, fell below 94 points in score.

In another situation the Rail-walking Test was administered to 48 soldiers who were referred as problems of locomotor coordination to the Special Training Unit at the Fort Bragg Field Artillery Replacement Training Center. The mean score for this group was 68.98 points with a standard deviation of 35.60 points. Thirty-nine, or over 80 per cent, of the cases fell below 94 points.

There are, however, several reservations which must be made in the gross use of the Rail-walking Test as an index of locomotor coordination. During training experience with problem soldiers in the Special Training Unit the author has observed that all persons with coordination problems do not necessarily have a low Rail-walking score. Awkwardness in the performance of a motor act is often due to poor comprehension of the task given to perform; but after the intellectual counterpart of the motor act is learned, the resultant performance is quick and smooth. For example, a soldier with a high Rail-walking score (*e.g.*, 135 points) but a low mental age (*e.g.*, 9 years) will display in the first phase of training much difficulty and awkwardness in performing a proper right-about face. But after he has learned to place his right toe behind and slightly to the left of the left heel, to place his weight on his left heel and right toe and to swing himself about to the right, the act will ever after be done gracefully. Yet the soldier well within normal limits of intelligence but with a low Rail-walking score (*e.g.*, 45 points) will in all probability never perform an about face with smoothness and proper timing in spite of much extra training and attention. There is also evidence that the emotional factor merits consideration.

Another reservation in the general use of the test is the fact that it does not differentiate well at the upper levels of locomotor coordination. But qualitative observation of the test performance will aid in distinguishing those somewhat above average from those of superior coordination. The latter will hardly sway a bit, appearing to control balance by slight movements of the ankles, while the former in order to make a perfect score must depend upon grosser movements of hips and arms to maintain equilibrium. Consideration is being paid to the possible refinement of the measurement of this performance by use of electric eye beams parallel

to the rails and set at distances from the rail varying according to the broad or slender build of the subject. The make and break of the beam and resultant recording may lend itself to measurement of amplitude and frequency of body sway as well as supplying in graphic form a permanent record of test performance.

Finally the Rail-walking Test must not be considered when fine differentiation is needed. Even though the reliability of the test upon immediate reexamination is high ($r = .94 \pm .01$ for 100 subjects of wide range of score), from actual observation of Army training a significant difference in score between individuals is closer to 20 points than to 5 or 10 points. To date the test has proved useful in the Army as a gross instrument in diagnosing awkwardness and predicting trainability.

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A COURSE IN ARMY PERSONNEL TECHNIQUES

BY CALVIN S. HALL
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Shortly after Pearl Harbor, when it became apparent that the Army would have to expand its numbers greatly, the writer considered how best he might help to prepare undergraduate students with majors or minors in psychology to qualify for some form of psychological work in the Army. After some investigation of Army needs and available materials, a course in Army personnel meeting three hours a week for one semester was introduced at the beginning of the second semester of 1941–1942. It is being repeated each semester of the current year. Some of the students who completed the course last year and who are now in Army personnel work have reported that this course helped to secure them their present assignments.

In the belief that other psychologists may want to introduce a similar course, and because the materials are in some instances difficult to locate, the following outline of the course in Army Personnel Techniques is presented:

I. Introduction. A brief consideration of the meaning of personnel work, its objectives, obligations, and importance in contemporary society.

II. Historical Background. Personnel management in World War I. The principal source for this topic will be found in *The Personnel System of the United States Army*, published in 1919 by the Committee on Classification of Personnel in the Army (**27**), which unfortunately is now out of print. See also Yoakum and Yerkes, *Army Mental Tests*, 1920 (**30**).

III. German Military Psychology. The transition from the previous topic to this one is made by way of Dodge's prophetic statement written in 1919 (**14**):

> At the conclusion of our war work, two real dangers confront us, one military, the other, social. The military danger is that with the passing of the military crisis we shall stop our study of the mental factors in war. If some other country with more permanent policies should take up the

mental analyses where we have left them, and develop a real military psychology, they would have a military instrument vastly more effective than 42 cm. guns.

The discussion of German military psychology is based primarily upon Farago's monograph, *German Psychological Warfare* (**15**). See also the special number of the *Psychological Bulletin*, devoted to Military Psychology (**18**).

IV. Personnel Administration in the Army Today. The organization of the Army and the agencies charged with formulating and administering personnel administration are briefly discussed. This section of the material is taken largely from Van Riper's "Personnel Administration in the United States Army" (**29**). See also *The New Army of the United States*, a publication of the War Department (**26**). For the role played by psychologists in the Armed Services, see the *Journal of Consulting Psychology* for Sept.-Oct., 1941 (**20**), and the "Psychology and the War Section" of the *Psychological Bulletin* (**7**).

V. Interviewing: The Soldier's Qualification Card. The Soldier's Qualification Card (**23**) is the most important personnel record kept by the Army. It is a card about eight by eleven inches in size, both sides of which are used. Information concerning the soldier's family background, education, occupational experience, and other personal data are entered by an interviewer usually at a Reception Center. The scores of all tests administered in the Army are entered, and a tentative classification of the man is made by the Classification Specialist. The card is kept up to date by entering each change in the soldier's status.

During this section of the course the students are instructed in interviewing techniques and the proper completion of the Soldier's Qualification Card. Each student is required to buy a copy of *Army Regulations No.* 615–25, *Enlisted Men: Initial Classification*, dated July 31, 1942 (**2**); this pamphlet supersedes the one dated September 3, 1940. Facsimiles of the Soldier's Qualification Card are found in the back. Reference copies of the *Interviewer's Handbook* (**25**) published by the Personnel Procedures Section of the Adjutant General's Office are available, but much of the material found therein has been included in the preceding pamphlet, AR 615–25. For women students who are contemplating enlisting in the WAACs, there is a supplement to AR 615–25 entitled *Instructions for Women's Army Auxiliary Corps Initial Classification* (**3**).

Optional materials are *Army Regulations No. 605–90, Officer's and Warrant Officer's Classification* dated May 21, 1942 (**1**); mimeographed copies of *Officer's and Warrant Officer's Qualification Card;* and Bingham and Moore, *How to Interview*, 1941 (**5**).

VI. Trade Tests. In this section the student is familiarized with trade tests, their construction, administration, scoring, interpretation and uses in the Army. The *Manual of Oral Trade Tests* (**16**) used by the United States Employment Service is not available for distribution; but there are a number of trade tests reproduced in Chapman, *Trade Tests*, 1921 (**12**), and in Thompson, *Interview Aids and Trade Questions for Employment Offices*, 1937, (**28**). Students are also referred to Stead and Shartle, *Occupational Counseling Techniques*, 1940 (**22**), regarding the construction of trade tests, and they practice administering and scoring a number of such tests.

VII. Intelligence Tests. The Army General Classification Test is given to all soldiers. It is the most important single test used in the Army. Since the GCT cannot be discussed in class even if one should happen to be familiar with its contents, the Army Alpha is used as a substitute. The meaning of intelligence tests, their administration, scoring and interpretation, and their uses in the Army are discussed. Materials and references are: copies of Army Alpha; Yoakum and Yerkes, *Army Mental Tests*, 1920 (**30**); *Memoirs of the National Academy of Sciences, Psychological Examining in the United States Army*, vol. 15, 1921 (**19**).

VIII. Aptitude Tests. The two aptitude tests most frequently used by the Army are clerical and mechanical, although other special tests are used by the Army Air Forces, the Armored Force, and the Signal Corps. Since copies of these tests are strictly confidential, the Minnesota Clerical Ability Test and the Revised Minnesota Paper Formboard Test are used for class demonstration. The following topics are discussed in relation to aptitude tests: construction, administration, scoring, norms, reliability, validity, relation of scores to other variables, and critical evaluations of representative aptitude tests. Each member of the class selects or is assigned a test (not always an aptitude test) on which he must write a term report covering the topics listed in the first paragraph of this section. Materials and references are: copies of the two Minnesota tests, and files of various aptitude tests: Bingham, *Aptitudes and Aptitude Testing*, 1937 (**6**); Buros, *The Mental Measurements Yearbooks* (**8**, **9**, **10**, and **11**); Greene, *Measurements of Human Behavior*, 1941 (**17**).

IX. Classification. The primary purpose of interviewing and testing is to provide suitable material on which to base a judgment as to the best assignment for each man in the Army. Proper classification is the crux of good personnel work and its importance cannot be over-emphasized. Materials and references are: the 720 page *Army Regulations, No. 615–26*, entitled *Enlisted Men: Index and Specifications for Civilian and Military Occupational Specialists, and Occupational Specifications for Non-English Speaking Men, Illiterates, and Men of Limited Mental Capacity*, of September 15, 1942 (**4**); the two-volume *Dictionary of Occupational Titles* prepared by the United States Employment Service (**13**); *Army Regulations No. 605–90* (**1**), regarding classification of officers.

X. Statistical Procedures. By using prepared statistical forms and adopting standard procedures for computing statistical constants, students learn to understand and compute the following: mean and standard deviation using grouped data, standard or z scores and percentile ranks, correlation using z scores, regression equations, standard error of estimate, and coefficient of alienation.

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THE COMMITTEE ON FOOD HABITS

BY MARGARET MEAD

Division of Anthropology and Psychology, National Research Council

The Committee on Food Habits was established in 1940 under the Division of Anthropology and Psychology of the National Research Council and operates under a contract with the Nutrition Division of the Office of Defense Health and Welfare Services. It parallels the Food and Nutrition Board, which operates under the same contract, under the Division of Biology and Agriculture. The function of the Committee is to formulate recommendations to the Director of Nutrition upon problems relating to food habits encountered in the coordination program of the Office of Defense Health and Welfare Services, and, where necessary to this end, to conduct studies and investigations and prepare reports upon such problems.

During 1941, the Committee had no substantial funds and confined its operations to occasional meetings and to the organization of two large conferences in May and June (**2**). In February, 1942, under the chairmanship of Dr. Carl E. Guthe, a permanent office was established in the National Research Council, with Dr. Margaret Mead as Executive Secretary and with two technical assistants, Dr. Natalie Joffe and Mrs. Rhoda Metraux.

The Committee on Food Habits is drawn mainly from anthropology, with single members representing the disciplines of medicine, nutrition, psychology, public health, and sociology. Members of the Committee are: Dr. Ruth Benedict, Dr. John M. Cooper, Dr. Allison Davis, Dr. J. K. Folsom, Mr. Lawrence K. Frank, Dr. Carl E. Guthe, Dr. Mark A. May, Dr. Nathan Sinai, Miss Mary E. Sweeny, Dr. Warren T. Vaughan, and Dr. W. Lloyd Warner. The Committee holds meetings at approximately two-month intervals, which include liaison sessions attended by the representatives of the various government bureaus and agencies whose interests in nutrition are coordinated by the Nutrition Division of the Office of Defense Health and Welfare Services. Problems of current importance are discussed, such as rationing, industrial feeding, and food and morale.

The Committee is officially charged with the task of providing expert opinions upon problems presented by the Nutrition Division and with the implicit obligation of developing and systematizing available scientific knowledge on the subject of food habits. During the past year the Committee has undertaken a variety of tasks:

1. It is developing a systematic approach to the problem of food habits, with particular reference to food habits of the American people at the present time.

2. On selected sub-cultural groups it prepares memoranda organized to express the point of view of the Committee, and it gives these memoranda limited professional circulation (**1, 4, 5, 6, 7, 18**).

3. Tests have been developed which can be used with school children in different parts of the country to reveal the characteristic food ideologies of different age levels and of different economic, occupational, religious and national background groups. This work has been done by Professor Kurt Lewin (**9**) and Mr. Alex Bavelas at the Child Development Station, State University of Iowa, and the tests have been validated on a sample of some 2,300 school children in Cedar Rapids, Iowa. Extensive background materials, including intensive interviewing and use of questionnaires, accompanied the construction of these tests.

4. Controlled experiments (**10**) have been made in methods of influencing food habits in real life situations at the State University of Iowa and under the direction of Mr. Earl L. Koos (**8**) with the sponsorship of Cornell University Medical College, Department of Public Health. In these experiments, directed toward determining the relative usefulness of the block plan as compared with the utilization of natural "friendship" groups, it was demonstrated that friendship groups were unsuitable for the dissemination of nutrition information—at least, among low income urban people of foreign background.

5. A series of current reports has been compiled for administrative use, dealing with American attitudes toward the nutrition program, meat shortages, rationing, hoarding, etc. These reports are based upon verbatim materials collected by undergraduate and graduate students in attitude sampling squads in cooperating universities and colleges, and analyzed by Mrs. Rhoda Metraux. The results have been supplemented in some cases by the researches of individual women psychologists, cooperating with the Committee through the Subcommittee on Services of Women Psychologists in the Emergency. In the analysis of the verbatim materials there have been two methodological innovations: (a) a method by which groups of students in the universities throughout the country could make a definite contribution to the war effort, and (b) a new method of analysis summarized in a graphic presentation, in a form suitable for administrative use, of the structure of the attitudes revealed in the verbatim materials. This method is based upon the anthropological assumptions that culture is systematic, and that by relating the regularities in responses of different groups all over the country, reliable clues to American attitudes may be found which are of a different order from those obtained by opinion sampling. A summary of these studies (**16**) is available for limited distribution.

6. The Committee has sponsored long-time research, aided by grants from private institutions, which contribute to our understanding of food habits. Two such projects are now under way: (a) a study concerning the psychosomatic mechanisms in obesity and allergy in childhood and attitudes involved in children's changing food habits, conducted by Dr. Hilda Bruch at The Johns Hopkins University, and (b) a study of the influence on food habits of different containers, by Professor Kurt Lewin of the State University of Iowa.

7. The Committee has sponsored and assisted in the compilation of pieces of voluntary research undertaken by graduate students on subjects immediately relevant to the wartime nutrition program (**3**, **17**).

8. It has served as a clearing house for food-habits projects, both in government agencies and throughout the country.

9. It has provided consultation and collaboration for those conducting research on food habits.

10. Through its Executive Secretary the Committee has been called upon for materials for current publications bearing on food habits (**11**, **12**, **13**), and for addresses at scientific meetings on the relationship between food-habit research and current problems (**14**, **15**).

In research the Committee is interested in experiments and studies of: (1) the content of food habits of special groups in the population, by locality, age, sex, national background, or race; (2) the motivations involved in food habits and any attempts to use these motivations for change; (3) different methods of changing food habits and methods of evaluating these experiments; (4) conditions involving food habits, e. g., asthma, diabetes, obesity, anorexia nervosa; (5) feeding problems and integration of eating habits with personality attitudes; (6) nutritional status as correlated with social or psychological factors such as education, socio-economic status, occupation, etc.; (7) the relationship between the emerging food problems connected with hoarding, fear of rationing, and rising prices and general morale; (8) techniques which have proved efficacious in introducing nutritional knowledge into community or agency programs; (9) the relationship of idiosyncratic physiological status to food choice; (10) experiences with reference to group feeding, school lunches, emergencies such as fire or flood, soup kitchens during the depression, etc.; (11) the relationship between food habits and other habits such as punctuality, use of time, etc.; (12) the way in which giving or withholding of food is used as a sanction in bringing up children; (13) the role of the nutritionist or home economist in different types of community program; and (14) changes in food habits as they provide leverage for other types of social change.

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THE ATTITUDES OF YOUTHS OF HIGH SCHOOL AGE TOWARD THE WAR

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During June and July, 1942, a study was made of the attitudes toward our war effort of 7,000 Chicago youths of high school age. The attitudes were obtained from English themes of 6,500 youths and from personal interviews with 500 other youths, the majority of whom were not attending high school.

The themes were written during the regular English periods at the direction of the regular teachers. The subject of the themes was "How the War Affects Me." No other instructions were given to these students, and they were asked to write as rapidly and as fully as possible. It was felt that the attitudes of these students would be expressed more freely if they wrote as a regular class assignment, as compared with writing or talking about them in some other situation.

It is obvious that it is difficult to obtain the attitudes of youths or adults because of various defensive reactions and because rapport between the interviewer and the interviewee is difficult to establish. A common method of discovering attitudes towards public problems is to ask direct questions. Usually, however, persons who are interviewed are quite guarded in their responses, and are likely to give answers which they believe are expected of them. Furthermore, it is exceedingly difficult to anticipate the problems involved in shaping the attitudes of an individual, and thus the ordinary questionnaire is not effective in obtaining the attitudes of the majority of those interviewed.

The title "How the War Affects Me" was chosen in order to avoid specific questioning on any one item or element relating to the war. As was expected, the subjects wrote on a variety of topics, often unrelated to the effects of the war upon themselves. The most serious drawback to this method of investigating the attitudes towards the war was the variation in the length of the themes which these students wrote for their teachers. Some students wrote three

to four pages, whereas others wrote a page, and a small number wrote as little as a half page. It is also possible that the introduction of the topic was too sudden and that preparation for the writing of the theme might have influenced many of the students to write longer papers. These undesirable elements were compensated for, however, by the neutral attitude of the teacher and the fact that the students expected that they would be judged mainly on their ability in writing the theme.[1]

The papers of these students were read by three persons in addition to the investigator. Before ratings were made, discussions were held regarding the purposes of the study, and samples of the papers were read aloud in order that there should be mutual agreement upon the various ideas expressed in the papers. Each judge then placed the papers he read in one of seven groups. A sampling was taken of each of these groups and the following classifications of the general attitudes of these subjects were made:

1. Direct antagonism to the war, including criticism of the government, of the war effort, and of the reasons for the war (more emotional and general than classification 2). *5 per cent.*

2. A critical attitude towards the war and towards the government, including criticism of the war and how the war is handled, criticism of rationing, etc. *6 per cent.*

3. Indifference. In this category statements were made that the war "perhaps could not be avoided," or "since we are in the war, we might as well go through with it." *21 per cent.*

4. Confusion, where the youth states that the whole war is a sort of a mystery and he does not know what to think. Often statements are made that perhaps it might be all right to have a war because people will learn how to save. *12 per cent.*

5. Mildly favorable attitude towards the war, but critical of specific elements. For example, one boy stated that there is no reason for taking young people, that older persons should go. Another boy said that they are going to draft his father and there is no reason why his family should be penalized because the nation goes to war. *9 per cent.*

6. A favorable attitude towards the war with the statement that he will try to help as much as possible, for example, by selling stamps, or by becoming a nurse or an airplane pilot. *26 per cent.*

[1] In discussing this research project with several colleagues, they pointed out that when the students were expected to write on "How the War Affects Me" they might have thought in adverse terms. In other words, they may have interpreted the question to mean that they must write on the adverse effects of the war, rather than on their true attitudes. As will be shown in this paper, this is a possibility but not a probability because of the different reactions of these students and the fact that such a large number of subjects did not make any mention of the adverse effects of the war upon them.

7. A strong favorable attitude with, perhaps, statements that we should have gotten in earlier and with parallel vindictiveness against the enemy. *21 per cent.*

Those who were against the war effort (classification 1) and who were 5% of the total group, frequently not only expressed an attitude that the Germans or Italians were justified in their aims, but also expressed an antagonism towards the President's policies.

Nineteen per cent of these youths stated that the Germans were forced to fight, and of these, over 90 per cent also expressed the attitude that the policies of this government resulted in our getting into the war. Thirty-five per cent of those who stated the Germans were justified in beginning the war also stated that we were responsible for our participation in the war by goading the Japanese to attack Pearl Harbor, or by conniving to get us into the war in order to profit special persons. The following excerpts from the papers of these youths are examples of their antagonistic attitudes:

"I think this was brought upon us because we did not know how to conduct ourselves with other nations. People say our enemies were aggressors, but we were aggressors also."

"If I were the President, I would never have sent so much material to England so that we now have to fight for England. I am not excusing Germany or Japan, but we could have made friends with everybody."

"War is a terrible thing and we should have done everything to stay out of it. Maybe Germany was taking advantage of us, but other countries have also taken advantage of us."

"I am as patriotic as anyone, but I believe that I am honest when I say that the President and the men around him goaded Japan to attack us. This gave him an excuse to get into the World War."

Those youths who were critical towards the war effort but did not show direct antagonism (classification 2), who were 6% of the total group, most frequently expressed the belief that this war is wrong because it will solve nothing and that we would not have gotten into the war had we conducted ourselves differently. They believe that there will be a serious depression after the war. Therefore, the war not only would not solve anything but would also leave us worse off than ever before. Thus these youths not only criticized the government, but expressed resentment against present and future deprivations.

Approximately 10 per cent of these subjects stated that the treaty after the last war was the direct cause of this war. The following are examples of the statements made and the items mentioned by students whose attitudes were placed in classification 2:

"I think the war was uncalled for in the first place, but I suppose we will have to go through with it since we are in it. When I read in the paper that they have so much sugar in the warehouses that they don't know

what to do with it and to think of all the millions of dollars the Government spent for it, it makes things look fishy."

"Maybe the war is all right because we had to get into it sometime, but we should not get in too good with Russia. They are also the kind of people you cannot trust."

"I really don't think we should have gotten into the war in the first place. Maybe we will come out of it all right and maybe not, but I am not sure."

"This war is not going to do us much good even though we are supposed to be fighting for democracy. As far as shipping materials and guns and food across the sea, that is all right, but I think everything we ship them should be paid for right away."

The statements of the youths which showed an indifferent attitude were placed in classification 3 and constituted 21% of the total group. A large number of these stated that the war perhaps could not be avoided, or since we are in the war we might as well go on with it. They seemed to express a somewhat neutral attitude, with statements that the war will be a long one and there might be a depression after the war.

About 40 per cent of the attitudes in classification 3 included statements about deprivation, such as a depression after the war, their inability to go to college, statements that there was no use saving money because inflation would surely occur, and complaints that rationing is to be instituted because of shortages and also because the government wanted to make us war conscious. The following are brief excerpts to illustrate these attitudes:

"This war doesn't mean much to me except that we have to get along with less sugar and maybe other things. But we have everything at home."

"I suppose we might as well get it over with because things might be different later."

When a subject showed confusion regarding the war and its issues, his attitudes were placed in classification 4. These constituted 12% of the total.

About a fifth of these youths stated that the war is a mystery to them. Over 30 per cent stated that in spite of all that they read about the war they really did not know what we are fighting for. Over 50 per cent emphasized their loyalty, but also emphasized their confusion about the war effort. Approximately 20 per cent stated that they had talked with their parents or other boys and girls about what the war meant to them, and they had not made up their minds as yet.

The 9% of the youths who showed a mildly favorable attitude towards the war effort neutralized, in some degree, by a variety of criticism were placed in classification 5. The attitudes were put

into this classification because they were definitely unsatisfied with one or more elements.

For example, one eighteen-year-old stated that there was no reason for drafting young people, and another, that rationing was unnecessary. Thirty per cent of this group stated that the administration in Washington was becoming dictatorial and was concerned more with its power than with winning the war. Approximately 10 per cent complained because there was too much censorship. Over 15 per cent stated that they were fairly sure that most of the navy was sunk but that the newspapers were not allowed to print the news. These youths in general said that they approved of the war but did not elaborate their statements. They merely stated that the dictators must be curbed, that war is inevitable in a world at war, that we were not quite smart enough to stay out of the war, but that we cannot expect to have supermen. Approximately 25 per cent of this group stated that they approved of the war principally because this conflict is so serious that people will learn to stay out of wars in the future. Not one of this group mentioned the seriousness of the possibility of losing the war, or the threat to us by the aggressors, nor did they mention any positive issues, such as the four freedoms or democracy.

Those who showed a favorable attitude towards the war without specific criticism of various war efforts were classified in group 6. Twenty-six per cent of the total number of subjects were thus classified.

These individuals did not mention rationing except that approximately 9 per cent complained about the attitudes of some people who are dissatisfied with rationing. Fully 50 per cent stated that we should have gotten into the war earlier and over 40 per cent stated that they felt sure that we will win the war.

The attitudes which were strongly favorable towards the war effort and which also included a vindictive attitude against the enemy were classified in group 7 and accounted for 21 per cent of the total.

Attitudes regarding their personal deprivations were included in approximately 53 per cent of the responses of the youths who were not strongly in favor of the war. The most consistent feeling of deprivation revolved about rationing and about the depression. Thirty-two per cent of these youths believed that a depression would follow the war, and about 75 per cent believed that more and more rationing would occur quickly. Eight per cent believed that we are headed for Socialism and Communism. Only 25 per cent made specific mention of the outcome of the war.

Of the youths whose attitudes were classified in the first four categories (44 per cent of the total), *i.e.*, antagonism, critical atti-

tude towards the war, indifference, and confusion, 65 per cent expressed various fears regarding the war. Of these, 8 per cent expressed the fear that the economic depression will be more serious than it ever has been previously; 10 per cent expressed the fear that everything would be ruined, that inflation would wipe out all savings and that no one will be able to get a job; 15 per cent stated that the suffering during and after the war will be intense; and 32 per cent expressed a general fear about the killing going on in the war, and their fears of seeing wounded soldiers.

When the contents of the students' papers were analyzed, more verbalizations were found in the higher age groups. Students in the third and fourth year of high school also showed approximately 10 per cent greater frequency of criticism either of the war or of governmental agencies than did younger students. The girls at every age group were more verbal than the boys and showed stronger attitudes either for or against the war effort, and in relation to the criticism of given war activities.

Summary

1. Of 7,000 Chicago youths of high school age, who were studied with respect to their attitudes toward the war, it was found that: 5 per cent showed direct antagonism toward the war, 6 per cent had a critical attitude, 21 per cent were indifferent, 12 per cent were confused, 9 per cent were mildly favorable, 26 per cent were favorable, and 22 per cent were strongly favorable.

2. In youths not strongly favorable toward the war, strong attitudes with regard to deprivations were found in 53 per cent of the cases.

3. In youths not favorable to the war in any degree, 65 per cent expressed various fears regarding the war.

4. There was more verbalization and more criticism in the older youths.

5. Girls were more verbal than boys and showed stronger attitudes.

PSYCHOLOGY AND THE WAR: NOTES

Women Psychologists and the Armed Services. Inquiries have been received from women psychologists as to the possibilities for psychological service within the Women's Army Auxiliary Corps (WAAC); Women Appointed for Voluntary Emergency Service (WAVES); the Women's Reserve of the Coast Guard (SPARS—semper paratus—always ready—motto of the Coast Guard), and the Marine Corps. Although it is not possible to give a definitive answer to this question, plans at headquarters of these organizations suggest that the services of women psychologists can and will be used both among officers and enlisted personnel. Psychological training will be particularly useful with reference to problems of allocation and placement of personnel.

A wide range of activities is to be carried on by the members of the three major groups. A composite list of activities includes:

*Accountants
*Aircraft Specialists
  Electrical
  Instrument
  Power Plant
  Propeller
*Bakers
#Bandsmen
#Bookbinders
*Bookkeepers
*Cashiers
#Classification Specialists
*Clerks
  General
  Commissary
  File
  Library
  Medical
  Postal
  Record
*Control Tower Operators
*Cooks
##Dental Assistants
*Dietitians
*Draughtsmen
*Drivers (automobile)
*Electricians
#Glider Instructors
##Hospital Assistants
#Instructors
##Laboratory Assistants
*Librarians
*Link Trainer Instructors
*Machinists
*Messengers
*Metal Workers
*Mimeograph Operators
*Motion Picture Projectionists
##Pharmacists
*Photographers
*Photo Laboratory Technicians
##Printers
*Radio Operators
*Radio Technicians
*Receptionists
*Secretaries
*Statisticians
*Stewardesses (mess sergeants)
*Store Managers
*Telegraph Operators
*Telephone Operators
*Teleprinters
*Teletype Operators
*Teletype Repairmen
*Typists
##Waitresses
*Weather Observers
#Woodworkers

All women who enroll in any of the services are urged to notify the Office of Psychological Personnel, 2101 Constitution Ave., Washington, D. C., immediately, giving full details. Insofar as possible steps will be

* Common to all services
# WAAC'S only.
WAVES and SPARS only.

taken to facilitate their functioning as psychologists. Following is a brief summary of enlistment procedures and conditions of service and training.

WAAC. The Women's Auxiliary Army Corps is organized for non-combatant service with the Army, to take the places of men in non-combatant positions and release them for front-line duty. Enrollment must be as an auxiliary. After four weeks of basic training, aptitude tests are administered to determine special fitness, after which further training at a specialist school may be indicated. The recent expansion of the Corps affords a wide range of opportunities for advancement of enrolled members, both as non-commissioned officers and through promotion to commissioned rank. All officer candidates are selected from the ranks of enrolled members to attend Officer Candidate School. At the present time the officers in the Corps with previous experience in personnel work are being used in selection and placement duties. The length of service is for the duration, plus a period of not more than six months thereafter. An applicant must be a citizen between 21 and 45, who can submit satisfactory proof of date of birth and citizenship and two character references. She must be able to qualify physically and to pass a mental alertness test. Married women can serve if they have no financial dependents. The monthly pay of an enrolled member is:

Auxiliary	$ 50.00
Auxiliary, 1st class	54.00
Junior Leader	66.00
Leader	78.00
Staff Leader	96.00
Teachnical Leader	114.00
First Leader	138.00

Officers' monthly pay is:

Third Officer	$125.00
Second Officer	131.25
First Officer	166.67

Further details may be obtained from any United States Army Recruiting and Induction Station.

WAVES and SPARS. The WAVES is an organization whose members replace Navy men at shore stations; the SPARS replace Coast Guard men at shore stations. Duties include all types of office work, jobs in radio, communications, storekeeping, and various special and technical positions. Basic training of enlisted personnel averages four months in a training school at one of the selected colleges over the country. The term of enlistment is the duration, plus no more than six months.

Enlisted WAVES or SPARS must be physically qualified citizens between 20 and 35, with at least two years of high school or business school, able to furnish three character references. A married woman may enlist in the WAVES provided her husband is not in the Navy, in the SPARS if her husband is not in the Coast Guard. Officers must meet the same requirements, except that they may be from 20 to 49 years of age, must have a college degree or two years of college plus at least two years of

acceptable business or professional experience. Also, two years of mathematics in high school or college is required for the WAVES. All officer candidates receive preliminary training at Smith College. (Incidentally, the head of the SPARS is a woman psychologist, Lt. Commander Dorothy Stratton.)

Monthly base pay of enlisted WAVES or SPARS is:

Apprentice Seaman	$ 50.00
Seaman, Second Class	54.00
Seaman, First Class	66.00
Petty Officer, Third Class	78.00
Petty Officer, Second Class	96.00
Petty Officer, First Class	114.00
Chief Petty Officer, Acting Appointment	126.00

Officers draw the same pay and allowance as men officers of equivalent rank in the Navy:

Ensign	150.00 plus allowances
Lieutenant, Junior Grade	166.67 plus allowances
Lieutenant, Senior Grade	200.00 plus allowances

Additional information may be secured from any branch of the Office of Naval Officer Procurement:

Atlanta, Ga. . . . . Healy Building
Baltimore, Md. . . . . Richmond Market Armory, North Howard Street
Birmingham, Ala. . . . . 601–609 Jackson Building
Boston, Mass. . . . . 150 Causeway Street
Buffalo, N. Y. . . . . Liberty Bank Building
Charleston, S. C. . . . . The Center, Marion Sq.
Chicago, Ill. . . . . Board of Trade Bldg., 141 West Jackson
Cleveland, O. . . . . 6th Floor, Marshall Building
Columbia, S. C. . . . . University of South Carolina
Dallas, Tex. . . . . 1530 Allen Building
Des Moines, Ia. . . . . 2nd Floor, Old Post Office Building
Detroit, Mich. . . . . 9th Fl., Book Bldg., 1249 Washington Blvd.
Houston, Tex. . . . . 824 Niels Esperson Building
Indianapolis, Ind. . . . . 429 North Pennsylvania Street
Jacksonville, Fla. . . . . 915 Lynch Bldg.
Kansas City, Mo. . . . . 202 Finance Bldg., 1009 Baltimore Ave.
Los Angeles, Calif. . . . . 850 Lilac Terrace, U. S. Naval & Marine Corps Res. Armory
Miami, Fla. . . . . Room 905, Langford Bldg., 121 S. E. 1st St.
Minneapolis, Minn. . . . . 4th Fl., Roanoke Bldg., 109 South 7th St.
Nashville, Tenn. . . . . Third National Bank Bldg., 3rd and Church
New Orleans, La. . . . . Louisiana Bldg., 217–227 Camp Street
New York, N. Y. . . . . 33 Pine Street
Norfolk, Va. . . . . 425 Federal Building
Oklahoma City, Okla. . . . . Post Office Building
Philadelphia, Pa. . . . . 17th Fl., Widener Bldg., Juniper & Chestnut Sts.
Pittsburgh, Pa. . . . . Keystone Hotel Bldg., 3rd Ave., & Wood Street

Portland, Ore. . . . . 1233 American Bank Building
Raleigh, N. C. . . . . North Carolina State College
Richmond, Va. . . . . 2nd Fl., Chevrolet Parts Bldg., Norfolk & Altamont
San Francisco, Calif. . . . . 703 Market Street
Seattle, Wash. . . . . 117 Marion Street
St. Louis, Mo. . . . . 6th Fl., Missouri Pacific Bldg., 210 N. 13th St.
Washington, D. C. . . . . 1320 G Street, N.W.

Marine Corps. The Marine Corps has established a women's reserve to be known simply as marines. Women between 20 and 50 are eligible as officer candidates, and between 20 and 36 as enlisted personnel. Applicants for commissions must have a college degree, or two years of college and at least two years of business experience, or "special qualifications in a particular field." Enlisted women must have at least two years of high school or business school, or special qualifications. Pay and rank are identical to that of men officers and enlisted personnel. Details can be obtained from any of the Offices of Naval Officer Procurement listed above.

Psychologists in War Work. During December, 1942, Dr. Walter S. Hunter, Chairman of the Department of Psychology at Brown University, made a study of supply and demand with reference to psychological personnel, acting as a committee of one for the Emergency Committee in Psychology of the National Research Council. Certain aspects of the study are of general interest.

The National Roster of Scientific and Specialized Personnel, as of November 1, 1942, lists 2,927 and 991 women with master's or doctor's degrees in psychology, a total of 3,918 professional psychologists. The American Psychological Association and its affiliated societies, which contain practically all who have any claim to a professional status, include approximately 3,850 individuals of whom about 1,000 are women. The total number of professional psychologists in this country, at a liberal estimate, does not exceed 3,000 men and 1,000 women. A more conservative estimate is 2,500 men and 900 women. Of this total professional group, many are unavailable for service outside of their present positions because of present essential civilian war work, age, physical disability, economic factors, dependency, and the like. Of those actually available, many would need refresher courses and training on specific jobs before they could serve effectively.

At the present time at least 25 per cent of the total pool of professional psychologists are serving as psychologists in the Army, the Navy, and the civilian agencies of government.

Registration with Office of Psychological Personnel. Both men and women psychologists interested in war work or other placement opportunities should continue to register themselves with the Office of Psychological Personnel. Names presented to various agencies are primarily those of psychologists who have indicated their availability. Psychologists should also, of course, see to it that their names are on appropriate registers of the United States Civil Service Commission.

If employment, address, or Selective Service status changes at any time, *both* the Office of Psychological Personnel, and the National Roster of Scientific and Specialized Personnel should be notified immediately. The Office of Psychological Personnel is located in the National Research Council, 2101 Constitution Ave., Washington, D. C.; the National Roster is at 10th and "U" St. N.W., Washington, D. C.

Committee on War Services to Children. The Committee on War Services to Children of the American Psychological Association is a continuation of the Committee on Refugee Children which was appointed in 1940 with the following members: Dr. John E. Anderson, Dr. Gertrude Hildreth, Dr. Kathryn E. Maxfield, Dr. Catherine C. Miles, Dr. Robert T. Rock, Dr. Gladys C. Schwesinger, Dr. Mary M. Shirley, Dr. Frank K. Shuttleworth, Dr. Anna S. Starr, and Dr. Arthur T. Jersild, Chairman.

The Committee has concerned itself with two lines of activity: direct psychological service in connection with war efforts in behalf of children, and research or fact-finding. The Committee has offered its services to various national and regional agencies. Members of the Association who are in contact with war work as it relates to children are invited to inform the Committee concerning their activities and to suggest ways in which the Committee might be most useful.

On the research side, the Committee, through one of its members, is preparing, for publication in the *Psychological Bulletin*, a critical review of literature dealing with the impact of war on children. It is planned that further comprehensive surveys be prepared as occasion demands during and following the war. The Committee would appreciate word from psychologists who have studies under way or who know of studies that are in progress.

BOOK REVIEWS

GRIFFITH, JOHN Q. & FARRIS, EDMOND J. The rat in laboratory investigation. Philadelphia: Lippincott, 1942. Pp. xiv+488.

Almost twenty years ago Dr. H. H. Donaldson, a member of the Wistar Institute, published his book, *The Rat.* That book was an almost indispensable reference book for anyone dealing with this animal in the laboratory. The present book, which bears many earmarks of the same Institute, is just as indispensable. The indispensability of the two books rests, however, upon different foundations. Dr. Donaldson's book is largely a book of norms of growth and development of the rat while the present manual is concerned chiefly with techniques of handling and studying the animal.

The *raison d'etre* of this manual is largely the tremendous use of the albino rat as a laboratory animal. No other species is so widely used. The rat is found in use in the laboratories of the physiologist, psychologist, biochemist, dietician, geneticist, and many more. It is probably safe to say that man knows more about the rat than he does about himself. It is one of the purposes of the thirty contributors to this book to describe the techniques by which this tremendous mass of information has been discovered. The value of the work is still further enhanced by the fact that many of these techniques may be applied to other animals as well.

The first two chapters are concerned with the general problems of the handling, breeding, and maintenance of health in the colony. The methods and apparatus described are chiefly those used in the large colony of the Wistar Institute. The material in these chapters will probably impress most readers as a description of ideals to be sought rather than a picture of the usual rat colony. Few laboratories have expended the money and care in the treatment of their rats that the Wistar Institute has. Nevertheless, the technician in even the most modest colony will find a number of very useful and practical suggestions.

Chapter 3 is a highly condensed version of the large and elaborate book by the same author on the anatomy of the rat. In 23 pages all parts of the rat's body are described in sufficient detail to serve as a foundation for much of the material that follows, particularly that concerned with surgical techniques. A number of drawings, several in colors, are used to indicate the main portions of the rat's skeleton and the mutual relationships of these parts.

Very little work has as yet been done with the rat embryo, but that it is feasible to do so within limits is indicated by a description of tried methods in Chapter 4.

Probably more experiments with the rat as a subject have been done on dietary deficiencies and requirements than on any other one subject.

The rat, being omnivorous, reacts to most food substances in much the same way as the human being. This accounts in a large measure for the animal's widespread use in diet laboratories. A large amount of this work has been summarized in Chapter 5. In the neighborhood of 60 different substances are discussed with reference to their role in the diet of the rat. The author refers to 269 journal articles.

The reader might normally expect to find chapter 6, on the teeth of the rat, in the section on the anatomical material. However, because of the peculiar properties of the tooth, "it is a valuable biologic indicator which mirrors and records, during its development, the metabolic status of the animal. This record, unlike similar records in the bones, is not transitory but is permanently engraved upon the enamel and dentine in which resorption does not occur." Therefore, an extensive discussion of the teeth is given with many diagrams and illustrations. Of particular interest is the description of the effect upon the teeth of various experimental factors such as diet, endocrine disturbances, etc.

Chapter 7, on the digestive system, describes a number of surgical techniques and the purposes for which they may be used. The author feels that experimentation on the digestive system of the rat has not been as extensive as it might well be and that there are many unexplored potentialities.

The metabolism of the rat is discussed in Chapter 8. Methods of measuring and factors affecting it are discussed.

Various surgical techniques for the investigation of the central nervous system occupy the few pages in Chapter 9.

By far the longest chapter in the book is the tenth, on "Technics for the Investigation of Psychological Phenomena in the Rat." This is perhaps a reflection of the fact that the white rat has been traditionally associated with the psychological animal laboratory. The technics range all the way from those dealing with tropistic behavior to social reactions. As might be expected in this chapter, there is noted a great amount of disagreement about what a given technic does or does not do. Much of this revolves around the lack of a standard terminology. To a neurologist, the term cisternal puncture indicates a definite and well-defined operation, but in psychology many of the terms used have almost as many significants as there are psychologists. This condition is caused by a number of factors among which are: (1) the newness of the discipline; (2) the complexity of the subject matter; (3) the taking over of many terms from common usage; (4) the inclination of some animal psychologists to use laymen's terms because of their attention-attracting value when applied to the animal.

On the other hand, it is probable that the standardization of experimental techniques can never go as far in animal psychology as it has in many other fields. This is because the psychology of even the rat is incomparably more complex than its digestive system, circulatory system, or any other part of its anatomy. Its psychology is the integration of all of these systems.

Chapter 11, "The Circulatory System," describes methods of taking blood pressure, taking blood, inducing pathologic states, etc.

The rather limited use which has been made of the rat in the biologic assay of hormones is outlined in Chapter 12.

On numerous occasions the reviewer has wished to have at his finger tips the information of Chapter 13. The greater part of the chapter is given over to a table showing the dosages and results of administration of a large number of drugs and chemicals. There are many factors which may help to determine the effects of a drug. Some of these are discussed and in the table the reference for each entry is given so the reader may refer to the original article for more details.

Chapter 14 considers the technics of blood study and blood diseases. A very interesting discussion is that of blood groups in the rat.

Chapter 15 is concerned with X-ray technic. The authors feel that the rat should be used more frequently in studies which require the making of roentgenograms because the size of the animals allows the use of portable and economical apparatus and small films. A number of interesting roentgenograms are reproduced.

Detailed directions for doing a number of surgical operations on the rat are given in Chapter 16. Perhaps the most difficult of the operations described is that of hypophysectomy. About 23 technics in all are outlined.

Histologic technics as applied to rat tissue are not particularly different from those used for other mammals. However, a number of formulae and methods which have been successfully used with rat tissue are given in Chapter 17.

The preparation of the skeleton for study is described in Chapter 18. Methods of chemical analysis are also indicated.

A very short discussion of the eye of the rat makes up Chapter 19. Most eyes have a hyperopia of about 5 diopters. Cerebellar tumors may affect the venous picture of the fundus.

Chapters 20 and 21 are concerned with animal parasites of the rat, the former with protozoa and the latter with metazoa. Some of these infestations are of great medical importance because of their part in spreading certain human diseases. The majority are important, however, only from a general scientific point of view and in so far as they affect the health and comfort of the rat under laboratory conditions.

The final chapter of the book will be of great interest to all who use rats for laboratory purposes. Nothing is quite so discouraging as having an infection wipe out a group of animals upon which a great deal of time and effort has been expended. This has happened once in the reviewer's experience, when the disease was paratyphoid. Although so high a degree of virulence of this disease is rather rare, it is not at all uncommon to find individual cases of it in a colony. Another disease which is very common and which often seriously incapacitates the animal even when it does not result in mortality is pneumonia. This is the disease which is often called "sniffles."

Cleanliness, adequate diet, plenty of fresh water, fairly constant temperature, and a sturdy stock will generally suffice to keep a colony healthy.

The writer has tried to give the reader of this review a very brief

indication of the contents of this book. The names of the authors have been omitted to save space. Some chapters are written by several authors and the same author may appear at several different places in the book. One has the impression as he studies the material that each author is writing on a subject with which he is thoroughly familiar. Documentation is very adequate.

The mechanics of the book are excellent. It is well printed, and glossy paper is used because of the presence of so many half-tones. It is bound in sturdy binding which looks as if it would stand being wiped off occasionally with a damp cloth. Thus, one may feel free to have the book at one's elbow in the laboratory.

The present reviewer can find no significant adverse criticism. His opinion is that the *The Rat in Laboratory Investigation* is a necessity for any experimenter or laboratory using the rat.

W. T. HERON.

University of Minnesota.

BOOKS AND MATERIALS RECEIVED

GELLHORN, E. Autonomic regulations. New York: Interscience Publishers, 1943. Pp. xii+373.

PENNINGTON, L. A., HOUGH, R. B., & CASE, H. W. The psychology of military leadership. New York: Prentice-Hall, 1943. Pp. ix+288.

RANSON, S. W. The anatomy of the nervous system. (7th Ed. Rev.) Philadelphia: W. B. Saunders, 1943. Pp. xii+520.

RAPAPORT, D. Emotions and memory. Baltimore: Williams and Wilkins, 1942. Pp. iii+282.

SHRODES, CAROLINE, VAN GUNDY, J., & HUSBAND, R. W. (Eds.) Psychology through literature. An anthology. New York: Oxford Univ. Press, 1943. Pp. xi+389.

WHITNEY, D. D. Family treasures. Lancaster: Jacques Cattell Press, 1943. Pp. 299.

———, Guide Book 1943–44. (1st Ed.) Washington: National Training School for Boys, 1943. Pp. 58.

NOTES AND NEWS

RODERICK N. MENZIES, on leave of absence from Sarah Lawrence College to the Office of Civilian Defense, died suddenly on Monday, February 22, 1943.

JAMES CARLETON BELL, for the past twenty years professor of education, City College (New York), and founder of *The Journal of Educational Psychology*, retired on January 31.

NORMAN FENTON, professor of education at Stanford University, has been appointed consultant in mental hygiene and delinquency prevention by the California Youth Correction Authority. He was formerly director of the Bureau of Juvenile Research in California.

G. L. FREEMAN of Northwestern University has been granted a leave of absence to take a commission in the United States Naval Reserve.

DOUGLAS PARRY, clinical psychologist, Syracuse University, has been appointed clinical psychologist, Bureau of Child Guidance, Southern Illinois Normal University, Carbondale. In addition to his work with children, Dr. Parry will give a course in guidance procedures, including individual guidance of freshmen and sophomores. REBA HARTLEY, who became a member of the department of physiology and health education last September, was recently appointed to the staff of the Bureau of Child Guidance.

The REVEREND ROBERT E. BRENNAN, O. P., founder of the Thomistic Institute, Providence (R. I.) College, has been appointed visiting professor of psychology, Institute of Psychology, University of Montreal. Father Brennan is giving a course in the history of experimental psychology.

DAEL B. WOLFLE, of the University of Chicago, spoke at a meeting of the Minnesota Chapter of Psi Chi, at the University of Minnesota, Wednesday, January 27, on "Teaching Psychology in Wartime."

RICHARD ARTHUR IBISON has left the Kemper Military School to accept a psychological internship at the Wichita Guidance Center. On the same date, MILDRED THOMAS joined the Center staff as a remedial teacher.

The National Training School for Boys has published an interesting Guide Book for boys entering the institution. DR. STEPHEN HABBE, U. S. Public Health Service Psychologist, is responsible for the preparation of the Guidebook. Psychologists who are interested may secure a copy by

writing to the National Training School, Washington, D. C., on the stationery of their organization.

A new monograph series, entitled *Applied Psychology Monographs*, has been launched by the American Association for Applied Psychology. The publisher is Stanford University Press. Inquiries concerning the new series, and manuscripts for publication should be addressed to the editor, DR. H. S. CONRAD, College Entrance Examination Board, Princeton, N. J.

Books For Prisoners of War. A request has been received from the War Prisoners' Aid of the Young Men's Christian Associations for books in the field of psychology, to be sent to allied prisoners of war who are in Axis hands. In the prisoner of war camps, there are teachers and graduate students in psychology, as well as classes organized by the prisoners themselves; requests for psychology textbooks and treatises are therefore frequent, and their provision is a great lift to morale. War Prisoners' Aid has had success in getting books into the hands of prisoners of war and from time to time prepares shipments to be sent across the seas.

One difficulty in transmitting books is that before shipment the approval of the censor of each book has to be obtained. Hence, a general request for donations to which, without doubt, many psychologists would respond, would be of little value. The procedure now worked out is that of requesting each psychologist to make up a list of the books that he is willing to donate for this worthy purpose and send it to MR. PAUL B. ANDERSON, War Prisoners' Aid, World's Committee of the Y.M.C.A., 347 Madison Avenue, New York City, who will check the lists with the censor and write to the prospective donor informing him which books will be accepted. Books sent to prisoners of war may not have any marks or erasures in them and the date of publication may not be later than September 1, 1939.

It is hoped that many psychologists will respond to this appeal by sending books within their own field. There have been requests from prisoners of war for technical and professional books, as well as for more popular types of books which are made available through other than professional sources.

The RESEARCH COUNCIL ON PROBLEMS OF ALCOHOL has announced an award of $1,000 for "outstanding research on alcoholism during 1943." The work must contribute new knowledge in some branch of medicine, biology or sociology important to the understanding or prevention or treatment of alcoholism. Citizens of the United States, Canada or Latin America are eligible for the award.

The project may have been inaugurated at any time in the past or during the year 1943, providided: (a) that a substantial part of the work be carried on during the year 1943; (b) that it be developed to a point at which significant conclusions are possible before the end of the year; and (c) that a report on the work has not been previously announced and described before a scientific body or previously published. It is desirable, *but not necessary*, that those planning to work for the award send to the

Council before March 1, 1943, a statement of such intention. A report of the work and resulting conclusions must be submitted to the Research Council on Problems of Alcohol on or before February 15, 1944.

The Committee of Award will consist of five members: an officer of the American Association for the Advancement of Science, and four representatives of the Scientific Committee of the Research Council on Problems of Alcohol.

If the committee is not convinced of the outstanding merit of the research done during 1943, as described in reports submitted, it may, at its discretion, postpone the award for another year, or until such time as work of such merit has been performed.

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Psychological Bulletin

THE STATUS OF RESEARCH IN REMINISCENCE

BY CLAUDE E. BUXTON[1]

State University of Iowa

The last general review on the topic of reminiscence was published by G. McGeoch (**48**) in 1935. Research since that time continues to reflect certain definitional and theoretical confusions which existed prior to her report. It is the intent of this paper to point out some of these confusions, attempt some clarification, and indicate the present status of our knowledge concerning reminiscence.

The Definition of Reminiscence

The definitional problem. McGeoch's definition of reminiscence made it an improvement in retention, as measured at some time after a partial degree of mastery had been attained, without formal intervenient review. The suggestion that such improvements in retention were merely the result of *informal* review is made by Williams (**70**) and by Woodworth (**72**). It has also been suggested that reminiscence is but a practice effect which results from the taking of successive tests. Brown (**4**) early pointed out that a first test of retention may serve to 'fix' items at or above the threshold of recall; it may also facilitate recall at the second test, in that items previously below threshold may rise above it through shifts in associative trends, etc. That items not demonstrably learned during a first practice may appear in a test after a rest interval has been shown by J. A. McGeoch (**50**). The definition given by G. McGeoch does not differentiate reminiscence from the gains which occur on the basis of either informal review or test-retest practice.[2]

[1] Many suggestions made by Major Arthur W. Melton have been incorporated in this review. The writer is very grateful for this critical assistance.

[2] Neither review nor test-retest practice fully explains why increases rather than an Ebbinghaus curve were found in the work of Ballard (**1**) and others. Also, as will be seen later, the temporal rise and fall of tendencies to reminiscence is difficult to reconcile with either of these "explanatory" factors.

A revised definition. By virtue of their experimental design, which will be discussed later, Ward (**68**), Hovland (**32**), and Melton and Stone (**55**) recently have made two changes in McGeoch's definition of reminiscence. First, they have attempted to prevent review of any sort, formal or informal; and second, they have ruled out practice occurring in successive retention tests on the same material. By so doing they require the demonstration of a phenomenon not explicable via the two obvious factors mentioned above. Since their design seems best fitted to serve as the basis for future work in reminiscence, a revised definition of the phenomenon, springing from their experimental operations, is indicated: *Reminiscence is an improvement in performance, as shown by some measure of ability to recall at some time after the original practice, without (any) intervening practice.* Two characteristics of this statement should be noted at once. First, an omission: no mention is made of partial mastery, although this is a widely accepted part of the definition of reminiscence. The omission is logical because degree of mastery is merely a variable in the amount of reminiscence. Second, it is specified that recall measures are the indicators of reminiscence.

Reminiscence and relearning. It is at this point that controversy is very likely to occur. Relearning scores have been accepted as a measure of reminiscence by many investigators (**6, 32, 33, 34, 46, 47, 52, 58, 63, 68**). Problems of reminiscence thus have been confused with problems in the distribution of practice, for when relearning is used as a measure of retention, the data actually arise from additional (spaced) formal practice. As a first step in the analysis of this confusion, it may be pointed out that interpolation of a filled rest interval in a learning process may plausibly have several different effects, as shown by comparison of an experimental group with a no-rest group: (a) improvement in recall plus relearning benefit (**32, 54, 68**); (b) improvement in recall but no relearning benefit or handicap (**10, 54**); (c) no improvement in recall score but relearning benefit (**46**); (d) no improvement in recall score and no relearning benefit or handicap (**10, 46, 55**); (e) loss in recall score but relearning benefit (**39**); (f) loss in recall score and neither handicap nor benefit in relearning; (g) loss in recall score and handicap in relearning (**10, 35, 55, 68**). If both recall and relearning performances are accepted as criteria of reminiscence, possibilities *a*, *b*, *c*, and *e* would be given that name, although in all but *a* the two kinds of data would be in internal conflict. The same

type of conflict would occur in attaching the label of forgetting.

Bunch and Magdsick (**6**), Hull *et al.* (**38**), and Ward (**68**) have indicated the possibility that changes in recall scores and changes in relearning scores may be deduced from the same general theoretical structure. At the same time it is evident from the above analysis that *empirically* these are two different sets of phenomena. *Historically* speaking, Ballard (**1**) and many after him (*e.g.*, **25**, **48**) thought it necessary to speak of reminiscence as a separate or new concept. Furthermore, phenomena of distributed practice usually have been given theoretical treatment on the basis of Jost's laws (**73**),[3] while reminiscence has in the main had its own (and different type of) theory. With empirical and traditional support, then, the present definition states that the word reminiscence should apply to *recall* data fitting the special conditions of the definition, and not to relearning data. The latter will therefore be disregarded in this review. It might be added that the construction of learning theory may be well served at present by not throwing these two great sets of problems together indiscriminately.

Experimental Controls and the Reality of Reminiscence

Verbal Learning

Review. As indicated above, many investigators have been reluctant to ascribe much importance to improvements in retention after formal practice had ceased because of the possibility that the *S*s had casually or intentionally revived the learned material between cessation of practice and the retention test or tests.

G. McGeoch (**48**) questioned school children concerning review between first and second retention tests of poetry which they had memorized. Although 84 per cent of the 3rd and 4th grade children in one of her experiments admitted reviewing in some way, retention in reviewing and non-reviewing groups (as shown by both verbatim and sense scores) was not significantly different. Forlano and Brunschwig (**26**) have confirmed this finding. (In neither study did reminiscence as measured in terms of group averages occur.) Unfortunately, both of these studies are subject to the test-retest error, which will be discussed below, and thus the relation of review to improvement in retention by individual *S*s is not adequately indicated by either of them. Also, there is room for doubt as to the validity of answers to questions about whether review occurred during the 24 hr. intervals they employed.

[3] Youtz (**73**) points out (p. 4) that the phrase "a new repetition" which Jost used has customarily been expanded to mean "further repetitions." Her work shows that this expansion is justified, and it is this form of Jost's law which is here related to relearning.

Because of the ambiguities involved in the evaluation of apparent reminiscence where review is possible, and because of the lack of convincing proof that casual review does not enhance retention, it seems necessary that this factor be eliminated before a valid finding of reminiscence can be claimed. The definition of the phenomenon given above reflects this conclusion, and many studies, on this basis, are open to criticism (**1, 14, 18, 19, 20, 22, 23, 25, 29, 45, 53, 56, 58**).

There are three ways in which to treat review as a factor in retention. The first is to require *S* to do something during the rest interval which should preclude review.

This technique is exemplified by studies which have required *S* to spend the interval in light reading (**10, 63, 68**), color naming or color association (**15, 32, 55, 68**), arithmetic problems or number cancellation (**15, 51**), or motor or mechanical activities (**12, 13, 46, 63**). The use of such activities during the rest interval or, indeed, the use of an "unfilled" rest period, makes the reminiscence experiment related to the retroactive inhibition experiment, as well as to those on work decrement (**2, 62**) or mental set and shift (**40**).

More specifically *E* must, *in the reminiscence experiment*, recognize that *S*'s retention may be affected by shifting attention from one task to another quickly, or being set to make such shifts.[4] There is also the question whether gains during the rest interval are simply signs of a recovery from fatigue, i.e., whether they are due to performance rather than to learning or memory factors.

Recognition of such relationships is made necessary also by the to-be-expected finding that the interpolated activities thus far employed have different effects upon retention. Ward (**68**) indicates, for example, that color association permitted more reminiscence to appear than light reading, and he suggests that color association might have a disinhibiting effect, in the Pavlovian sense. Unfortunately, the effect of color association was studied in a supplementary experiment with only 6 *S*s. There is thus an additional interpretation of his finding: the light reading had a slight retroactive effect (which is particularly possible in any reminiscence experiment employing verbal learning). Shipley (**63**), like Ward,

[4] A possibility needing exploration is that reminiscence may not be found in experiments employing interpolated activities (*e.g.* color naming) unless S is well-practiced at shifting from learning to naming and back again. That is, at the time of recall S may not have the appropriate set unless he is accustomed to making the rapid shifts required in such experiments, and his recall score will suffer accordingly.

found that two types of rest-interval activity were not equal in their effects upon retention: *S*s who worked at a mechanical toy retained slightly more than *S*s who read *College Humor*. Reminiscence as shown by means did not appear in this research, but the interpretation of the effects of interpolation is the same. It is apparent, on the basis of experiments on retroactive inhibition, that the activity which fills a "rest" interval in a reminiscence experiment should be dissimilar to the learning activity.

A further consideration in experiments employing the interval-filling technique is that although they may restrict review greatly, there is as yet no guaranteed method of eliminating it. For example, in Hovland's well-controlled experiments (**32**, **33**, **34**) there is still a possibility that *S*s could review while they were naming colors at a 2 sec. rate. This also might be said of number-cancellation in the experiments of McGeoch, McKinney and Peters (**51**). The rapid color-naming used by Melton and Stone (**55**) seems to be an improvement over the procedure of Hovland or Ward because it keeps *S* busier. On the other hand, the light reading employed by several investigators is suspect for there is little or no objective indication as to whether *S* is reading or simply turning the pages while he thinks about what he has learned. Filling the rest interval with mechanical or motor activities might distract *S* very little from review. Finally, in experiments which reduce individual differences in memorization by using the same *S*s for many sittings with different lists, there is the possibility that as *S* becomes more and more aware of what is expected of him he will become more skillful at reviewing on the sly. This possibility can not be checked in data of experiments done to date because an increase in apparent reminiscence would be confounded with variance due to practice at the original learning and recall techniques, as well as with variance due to lists, which have been used in the same order for all *S*s. It is subject to both objective and introspective checks, however.

The second treatment of the factor of review is to use questionnaire or other methods to determine how much reviewing there has been, and to discard *S*s who admit it, or to analyze their data separately. In all the reminiscence experiments in which review has been prevented or restricted, rest intervals were 20 min. or less in length. Since it is unlikely that any procedure will soon be hit upon to rule out review, where the interval is too long for *E* to control *S*'s activities, it seems necessary that any study involving such intervals should as a minimum follow the procedure of Mc-

Geoch or Forlano and Brunschwig (see above) and attempt to determine how much reviewing there has been. Further use and investigation of the procedure of requesting *S*s not to review, as was done by Hovland (**35**), Raffel (**59**) and Ward (**68**), seems worthwhile. Systematic studies of this sort may lead to some correction of retention curves over the longer intervals.

The third treatment of the factor of review is fairly well demonstrated by the study of Raffel (**59**), in which *S*s were *forced* to review via recall tests given each day or at longer intervals. At each test she was able to note the occurrence of repeated or previously unrecalled items. Raffel's procedure and variations of it should, like the second treatment suggested above, permit evaluation of the effects of review rather than elimination of it.

Test-retest practice effects. As pointed out previously, and as implied by the definition of reminiscence, if retention is measured by two or more tests over the same material with the same *S*s, an improvement in retention can not be called reminiscence because the first test serves as an additional practice period.

Three authors have recently reported special studies of this factor. Bunch (**5**) had students in general psychology study poetry. He then asked for a written reproduction, followed immediately by a second reproduction. There was a statistically reliable increase in the average number of lines correctly recalled, and 61 per cent of the *S*s showed improvement. Gray (**29**) studied retention of word lists, sentences and paragraphs, where a delayed recall preceded by an immediate could be compared with a delayed recall *not* preceded by an immediate. The double-test groups all showed statistically reliable superiority (but no reminiscence). The application of such findings to reminiscence experiments in general is clear, but special attention is merited by an experiment of Deese (**15**). *S*s studied poetry, then were given rest intervals of 0, 2, 5, and 20 min. Review was precluded or restricted by requiring color-naming and other activities of *S*; test-retest practice effects were ruled out by the nature of the testing program. Under these conditions *no* reminiscence, in terms of averages, was found.[5] In fact, there was a definite loss by 20 min., and no reason to believe that with a longer interval retention would have improved again. This finding throws considerable suspicion on the many experiments where these controls were not applied (**14, 15, 22, 23, 24, 45, 51, 53, 56**).

Two simple experimental designs enable *E* to either rule out test-retest practice effects or hold them constant during the study of other factors in reminiscence. One of these designs (**5, 29**) in-

[5] Other measures, *e.g.*, the per cent of *S*s showing improvement, might have shown the existence of reminiscence, but its statistical reliability presumably would not be great.

volves (a) bringing an experimental and a control group to equivalent levels in their learning, (b) giving the control group an immediate test, (c) giving the experimental group its first test after some time interval. The difference between the two tests, one for each group, will give an indication of the amount of reminiscence which can be evaluated statistically. Where *E* has no record of the progress of learning and must work with the single recall which follows learning, the initial matching of groups may be difficult. This is not the case in serial learning. *E* here has a continuous record of the level of mastery and can equate groups by specifying a criterion which is to be reached before a rest interval is given. Ward (**68**), for example, used a control condition in which *S* learned to one perfect trial and without rest had another trial (immediate recall test), and an experimental condition in which *S* rested between the first perfect trial and the next trial (delayed recall).[6] Hovland (**32, 33, 34**), McClelland (**46**), Melton and Stone (**55**), and Shipley (**63**) have also utilized this procedure.

Another design (**5**) employs an immediate test for both a control and an experimental group. A second test occurs at once for the control group, and after any desired time interval for the experimental. The difference between second tests for the two groups is the measure of reminiscence. This method aids in the matching of experimental and control groups where the type of learning procedure makes this matching a problem (see above), but it holds test-retest practice constant rather than eliminating it.

Either of the two designs (and it is not implied that these are the only two) has its advantages, but the point which should be stressed is that the adoption of a fairly standard design would aid greatly in improving the quality and comparability of various researches in reminiscence. The designs of Ward, Hovland, and Melton and Stone treat test-retest practice in the same way (elimi-

[6] In his supplementary experiment A, Ward (**68**) determined the *average* number of trials for each of 6 *S*s to reach a criterion of 7 out of 12 items. He then used the same *S*s in supplementary experiment B. Here, to equate the original learning in control and experimental conditions, each *S* was given that average number of trials, rather than being carried to the criterion itself. Since the original learning was not stopped when an arbitrary criterion was reached, *S*s should drop but little on their recall in the control condition. Should recall in the experimental condition be reliably superior this would be evidence that reminiscence in serial learning is independent of the use of an arbitrary mastery criterion. Ward's results point in this direction, but the N was small, reliability evaluations were not made, and the *S*s were sophisticated.

nating it) and may serve as a model for future work in this respect. At the same time, even they have not standardized the method to be used in filling the rest interval, and this problem requires study.

Motor Learning

Although reminiscence in motor learning has not received a great deal of attention, this is an area in which studies of the distribution of practice have been very numerous, and therefore is an area in which the extent of occurrence of reminiscence greatly needs evaluation. To permit consistent usage of a definition of reminiscence in terms of a recall measure, it is necessary to assume or design the experiment so that skill in motor learning, as shown by a trial score, is analogous to, *e.g.*, the number of items correct on a recall trial in serial learning.

Review. In contrast to verbal learning, practice of a motor skill during the rest interval is preventable insofar as overt practice is preventable. In pursuit learning, for example, *E* has only to keep *S* away from the instrument, or to prevent other overt movements which might transfer to the pursuit task. Doré and Hilgard (**16**, **17**) have published data showing evidence of reminiscence in this task, and Snoddy (**65**) in mirror tracing. Covert practice during the rest interval, while probably less effective with these tasks than review with verbal materials, is nevertheless a real possibility. Bray (**3**), for example, showed that symbolic practice given via coaching transferred to mirror target performance; Buxton (**7**) has indicated some of the possible ideational factors in pursuit learning, although direct studies of them are few in number (**60**). The suggestions made concerning elimination or control of review in verbal learning experiments are all three capable of application to motor learning experiments.

Test-retest practice effects. The first experimental design for eliminating such practice effects, *viz.*, bringing control and experimental groups to the same level of learning, giving the control group an immediate test and the experimental a later test, is particularly applicable to motor learning studies. As in serial learning, most motor learning tasks are so devised that there is evidence of the level of learning in performance on each trial. Specific mastery criteria may be used to equate groups, as in anticipation learning.

Summary

The question may arise: is there *any* valid evidence of reminiscence? Large numbers of studies are invalidated because they fail

to exercise one or the other of the controls discussed above. It seems advisable to require that *all* proper controls should be exercised before evidence is accepted. In this light, the basic experiment of Ward (**68**) can not be accepted completely, because of the possible influence of review during the interval spent in light reading, and because his supplementary experiment which required color association was not thorough enough. Well-controlled experiments in which reminiscence failed to appear are those of Deese (**15**) and Melton and Stone (**55**), but as we shall see later the failure probably was due not so much to the control of test-retest practice and of review, but to other and legitimate experimental variables. The experiments on motor learning need checking under controlled conditions in which a direct attempt is made to study reminiscence. Hovland's systematic experiments (**32, 33, 34**) remain as the most substantial evidence for the reality of reminiscence—and even here, as suggested previously, there is the haunting possibility of review.

Measures of Reminiscence

Type of data collected. Various indicators of retention, based on the recall trial, have been employed. Nearly all of the better-controlled experiments described in this review recorded the number of items correctly anticipated in serial verbal learning (**32, 33, 34, 55, 68**). There are few equally good data based on other types of recall which may be used for purposes of comparison.

For example, Hovland (**34**), working with paired associate material and performing well-controlled experiments, employed the method of right associates in the recall test and found little or no reminiscence, but, as will be discussed later, the method as such was probably not the reason. McGeoch, McKinney and Peters (**51**), however, also used paired associate material (in experiments open to the test-retest error) and found reminiscence.[7] Written reproductions likewise have often been required, but of five experiments, all open to test-retest and review errors, three (**14, 45, 48**) found reminiscence and two (**26, 56**) did not. An association test was used by Raffel (**59**) to measure retention of a list of 100 familiar words; *S* combined free association and oral reproduction in an attempt to say 150 words, credit being given for correct words from the list. Witmer (**71**) required *S*s who had learned a list by the anticipation method to respond, in the retention test, by saying the first syllable which came to mind when *E* presented the items of the original list in mixed order. There was some evidence of reminiscence in both these studies but both are open to criticism.

[7] The comparison is complicated by several other differences in procedure. See Hovland (**34**, pp. 477–479) for a discussion of these points.

It may be said that this paragraph exemplifies the lack of comparative data on measurement procedures in this field.

Simley (64) showed that items which were slow to rise above the threshold of recall in paired associate learning had longer reaction latencies than items which rose more quickly above the threshold. Some shortening of the latencies occurred thereafter in either case, which Simley interpreted as evidence that the associations were increasing in strength.[8] Following Simley's interpretation, measures of response latencies during the recall trial have been employed as indicators of retention by Ward (68), Melton and Stone (55), and McClelland (46). This technique gives a more finely scaled indication of the level of retention than the simple recording of presence or absence of response, and the measurements are sufficiently precise to reveal progressive latency decrements as amount of practice on adjective lists increases (55). However, the latency measurements may be of low reliability, particularly for central items in a list. This possibility, as pointed out by Melton and Stone (55, footnote 6), is difficult or impossible to check because " . . . the same subjects do not yield latency measurements for a particular item under all experimental conditions, or . . . the number of latency measurements for a particular trial varies from subject to subject and from condition to condition." Reaction-latency measures thus seem to be of doubtful value, or at least are difficult to interpret.

Performance scores on a recall trial may be used in studies of reminiscence in skill acquisition (8). Snoddy (65), in mirror tracing, for example, used velocity scores based on the pacing of *S* to equate the number of errors and the seconds necessary for a circuit. Renshaw and Schwarzbek (59) used errors per cycle on a pursuit meter; Doré and Hilgard (16, 17) used length-of-contact scores on a pursuit rotor, as did Travis (66, 67) on this apparatus and the pursuit oscillator. The amount of letter-code translation per trial was the measure of learning in the work of Gentry (27) and Lorge (44).

The principal conclusion to be drawn from the above discussion is that at present there is no indication that the occurrence of reminiscence depends upon the type of recall or recall measure. The conclusion is drawn in the absence of comparative studies rather than on the basis of such studies.

[8] Reaction latencies tend to become asymptotic. Simley suggests, however, that strengthening of the *association* may continue *after* this happens.

Treatments of data. Most investigators in the field of reminiscence have reported measures (*e.g.*, means) based on the performance of a total group of *S*s. G. McGeoch (**48**) argued that such measures are not valid in the study of reminiscence, for reminiscence is an affair of the memory of an individual *S*, who either improves or does not. Averages can conceal the fact that many *S*s have improved slightly while one happens to lose greatly in retention score. Following Ballard (**1**), she employed a supplementary measure which is quite widely used—the proportion of *S*s who show improvement in individual total score (**20, 26, 32, 33, 34, 45, 51, 59**). Several of these investigators also report the proportion of *S*s whose score does not change from the initial to the final test, and the proportion whose score decreases. In some instances, the average change in a total sub-group of *S*s whose scores improve or become poorer is reported as a supplement to the proportion of *S*s in the sub-group itself (**1, 48, 51**).

Underlying the use of the percentage of *S*s showing improvement in retention, as evidence of reminiscence, is the notion that there are individual differences in the display of this phenomenon —some *S*s are reminiscers, some are not. There is as yet no study which reliably demonstrates this,[9] nor are there direct studies of the degree to which the percentage of *S*s who improve varies with experimental conditions.

There is a more important consideration of the use of this measure to date: the mere fact that a certain number or percentage of *S*s improves in retention does not prove that reminiscence is occurring. There are three possible causes of such a finding: (a) In many studies the test-retest error is involved. One might expect that on a chance basis some *S*s would profit sufficiently from the first test to compensate for their forgetting. (b) At the time of the first test, certain items are likely to be very near (above or below) the threshold of recall. By chance more items might rise above the threshold than dropped below it for certain *S*s and improvement in total retention score would be noted for these *S*s.[10] (c) In studies

[9] The closest approach is found in a study by McGeoch, McKinney, and Peters (**51**), where there are indications that the *amount* of improvement in *S*s showing improvement might be a constant under different experimental conditions.

[10] The reaction threshold, a concept employed by Simley (**64**), is developed by Hull *et al.* (**38**). The level of this threshold for a given item is assumed to vary from trial to trial, according to a normal probability curve (postulate 15). It thus is possible for an item to be anticipated correctly, then be missed for one or more trials before it re-appears, or never to be anticipated correctly until the final recall.

employing systematically counterbalanced control and experimental conditions (**30**, **66**), some of the *S*s might be expected to show retention increases because of the chance location of the control condition at an unfavorable place in the practice series. Therefore the number or percentage of *S*s showing improvement, standing alone, is not an adequate indicator of the amount of reminiscence. After the test-retest error is ruled out, two further treatments are required: (a) the reliability of such measures must be determined; (b) they must be compared statistically for the control (no rest) and the experimental conditions. Only when the number or percentage of *S*s improving is used in this way will it approximate the validity of means as a measure of reminiscence (assuming that the latter are given the same rigorous tests).

A more detailed treatment of data has been used by a few investigators. This is the computation of the proportion of new and/or old and/or lost items. In a sense this type of treatment carries the argument against the use of group-total retention data a step further: reminiscence is an affair of individual items, not an affair of total score (**24**).

As examples of the procedure, Luh and Liang (**45**) used the percentage of reminisced and forgotten items in comparing the immediate and the delayed test; Martin (**53**) recorded for each *S* the number of items available to reminiscence, *i.e.*, not given on the first recall, and thereafter the number of items reminisced and not reminisced out of this available number; Raffel (**59**) reports the mean number of words reported for the first time on each recall, as well as the number repeated; Edwards and English (**19**, **23**) record the proportions of items which fall in various *patterns* of right and wrong on two or three successive tests (all of these studies were open to the test-retest error and review).

The statistical checks necessary for treatment of percentages of *S*s showing improvement are equally necessary for the item measures. This point should be clearly understood, for reminiscence theory must be concerned first of all with individual items, and only secondarily with other measures.

Factors in the Amount of Reminiscence Displayed

G. McGeoch (**48**) indicated that up to 1935 there was no reliable evidence that the occurrence of reminiscence was related to the age, sex, or intelligence of the learner. This conclusion still holds, but there has been little or no further work directed specifically at these characteristics of the learner and so they will not be discussed here.

Learning technique. In the research of Ward (**68**) and Hovland (**32**) and the theories of Hull *et al.* (**38**) the existence of intra-serial interference or inhibition during the original learning is deemed the important condition for the occurrence of reminiscence after a rest interval. It thus becomes important to know whether the type of learning technique employed (anticipation, serial learning) is a determiner of the presence of such interference, and therefore of reminiscence. One list is said to exhibit more of such interference than another if, (a) on the first, *S* requires more trials to reach a given mastery criterion, (b) the relative difficulty of center items, as compared to end positions, is greater in the first, and/or (c) oscillations about the threshold of recall are of wider extent in the first, as measured by the difference between the number of trials preceding the one on which a given item first is anticipated correctly and the number of the last trial on which it is missed. With a 2 sec. rate of exposure, Hovland found all three signs of intra-serial interference more clearly indicated than with a 4 sec. rate, and reminiscence occurred with the former but not with the latter.

Hovland's instructions required that if *S* made an error or failed to respond within the anticipation interval he had to correct himself *and also* attempt to anticipate, during the next such interval. In contrast, Ward (**68**) and Melton and Stone (**55**) did not instruct their *S*s to make such corrections. It seems very possible that if corrections are required they may be an added source of confusion, *i.e.*, intra-serial interference. Furthermore, Ward required the spelling of nonsense syllables, whereas Hovland required pronunciation, as did Melton and Stone with adjectives. If spelling is also deemed a source of intra-serial interference, because it is more complicated than pronunciation, the following speculation might be made: Ward found reminiscence partly because he used the spelling procedure; Hovland found it partly because he used the correction procedure; Melton and Stone did not find it because they employed neither subsidiary procedure. Even within serial anticipation learning, variations in technique may be significant for the occurrence of reminiscence.

There seems to be only one attempt to study the effect of two clearly different learning techniques with the same type of material. Hovland (**34**) compared retention of serial lists and paired-associate lists of nonsense syllables (order of pairs randomized), the anticipation method being employed with each. Reminiscence was present in the former but absent in the latter except in terms of a minority of *S*s who showed improvement. In analyzing this finding Hovland points out (p. 481) that the 2 sec. rate was used with the serial learning but in the paired-associate learning 2 secs.

were allowed for the exposure of the stimulus item of a pair (*i.e.*, for anticipation) and 2 secs. for exposure of the response item (and for corrections). In effect, the two learning techniques were not comparable because responses were 2 secs. apart at a maximum in the serial learning and 4 secs. apart in the paired-associates. The experiment is not conclusive, then, concerning differences in technique or opportunities for interference to occur, unless it be admitted that the response-rate differences are inherent in the procedure. Hovland suggests that this may be the case (p. 481).

Reminiscence has been found with several variations of the method of complete exposure, but the data which might permit comparison with the previously mentioned learning methods are affected by test-retest practice (**14, 19, 20, 22, 23, 25, 45, 51, 59**).[11] What might be called an incidental method of learning was employed in Martin's study (**53**): *S* performed many simple tasks and later was asked to name them. Conventional practice trials have, of course, been the learning method in the studies of skill acquisition which seem to indicate reminiscence (**8**).

If we accept interference as an important variable in reminiscence, we can assume that the various techniques mentioned will determine whether the phenomenon occurs insofar as they, by their nature (type of response required, degree of pace-forcing, etc.) produce interference. As yet we have only the serial learning variations to support this statement.

Subject matter. To return to the fact that Hovland (**32**) found reminiscence with syllables, while Melton and Stone (**55**) with adjectives did not, it may be noted that the latter investigators used both a 2 sec. rate and a 1.45 sec. rate, and showed that in terms of all three criteria listed above, interference increased as the rate of exposure was stepped up. However, the increase in number of trials to criterion and the increase in relative difficulty in center items were both unreliable, and a statistical comparison of oscillations about the threshold of recall was not made. (There was, nevertheless, a consistent trend in all comparisons.) The question can be raised: even if the increase in interference *does* occur in adjectives if exposure-rate is stepped up, is the actual amount of interference large enough to serve as the basis of reminiscence? Syllable and adjective lists must be compared directly to answer

[11] The above studies employed the whole method of learning. Since G. McGeoch (**48**) showed that there was not a significant difference in amount of reminiscence when the part and whole methods were employed, this topic has not been investigated. Repetition of her work, eliminating the test-retest practice and including the checks on review, is needed.

this question. At present the contrast between Hovland's findings and those of Melton and Stone shows that the relation of Hovland's three indicators of interference to the occurrence of reminiscence has yet to be clearly established. This is shown in another way by McClelland's study (**46**) of discrimination learning with adjective pairs, in which greater difficulty was evidenced with the faster of two exposure rates, but there was only a very slightly greater (and unreliable) tendency for reminiscence to appear with the faster rate.

A dozen or more different types of learning materials have been used in various studies of reminiscence. Because almost all the experiments themselves are open to criticism on the basis of design, no attempt will be made here to catalog the materials. The principal dimension in which they differ is the amount of meaning or organization which they possess for *S*, varying from nonsense-syllable lists to ballad poetry. It seems very possible that intra-material interference might be a widespread phenomenon, although measurement of such interference is likely to be more difficult in, say, a prose passage, than in serial learning. If we grant the importance of such interference, and speculate that it might decrease as the degree of organization or meaning increases, we should expect to find that type of subject matter is a determiner of reminiscence. That this is the case is clearly suggested only by the findings of Melton and Stone.

Special attention should be paid to the apparent dependence of reminiscence upon what is called the type of learning by English and his associates (**18, 19, 20, 22, 23, 24, 25**). In their work, *S*s studied a prose passage; retention was measured by a true-false test containing two kinds of items: summary (S, covering the content of a sentence, or several sentences, or even a paragraph) and verbatim (V, based on some exact statement from the text). Their Table 5 in (**23**) and Fig. 2 in (**18**) apparently show that there is improvement when retention is measured by S items and loss when it is measured by V items. The work can be criticized in several ways: (a) It was open to test-retest and review errors—which would not explain the differential retention curves. (b) Several of the experiments were based on the learning of a prose passage of psychological nature; the *S*s were psychology students and it might be expected that transfer would benefit the S items much more than the V items, and thus produce differential retention. (c) The published data all deal with *absolute* numbers of reminiscent or forgotten items. This completely disregards the fact that, since S items were more difficult and more often wrong on the first test, the opportunity for reminiscence in them was much greater than in V items. The latter were easier and more often right on the first test, and consequently offered more opportunity for forgetting.

Buxton (**9**) applied chi-square tests to some of the published data and was able to show that in at least one of the studies (**23**) the occurrence of reminiscence (and also of forgetting) was independent of type of item when opportunity for the occurrence of reminiscence (or forgetting) was taken into account in the analysis. Also, the occurrence or non-occurrence of reminiscence was independent of difficulty, while the occurrence of forgetting *did* depend upon difficulty of items. Bearing in mind the necessity for the elimination of test-retest practice and review, and for the control of transfer and difficulty, and finally for the use of relative data (which will not be necessary when difficulty is controlled), the conclusion must be that at present the studies of English and his colleagues do not constitute valid evidence that type of learning (or, more correctly, the type of measurement of retention of a given subject matter) is related to amount of reminiscence. These criticisms have been discussed by English (**21**).

Unfortunately, method of learning and type of subject matter have tended to vary together. Most of the work with nonsense syllables has been done with the anticipation method, much of the work with poetry has been with complete exposure and written reproduction, and much of the work with motor tasks has been done in conventional practice trials. To a certain extent, this is unavoidable. But also, to a certain extent, ingenuity can be used in applying a given method to various subject matters, or various methods to the same subject matter. In any attempt to secure such comparative data, the equating of levels of mastery, or amounts of practice, difficulty of items, etc., requires special attention.

Degree of mastery before rest. Ward (**68**) compared amounts of reminiscence in 12-item syllable lists learned to a criterion of 7 correct with amounts in lists learned to one perfect recitation. Because serial position as well as the number of repetitions, governs the degree of learning, he made an analysis (discussed below) in which he noted amounts of reminiscence in central syllables and amounts in end syllables separately, concluding that " . . . the results at the shorter intervals of 5 minutes or less indicate that relative retention and amount of reminiscence are inversely related to degree of learning" (p. 39).

Certain data from two of Hovland's papers (**32**, Tables 1, 2, 4; **33**, Tables 1, 2, 3) serve to extend Ward's conclusions somewhat. Hovland's evidence indicates that reminiscence is not as great in absolute amount after a low degree of mastery (1 trial only), or a high degree (1 perfect trial), as it is after a moderate degree of mastery (7 out of 12 correct). To generalize, one might expect the

following: with a low degree of mastery few items have risen near enough to the threshold, at the time of the rest interval, to be available for reminiscence; with a high degree of mastery few items are not already above threshold. Both stages of mastery should be inferior in *absolute* amount of reminiscence (number of items reminisced, without regard to number in list) to moderate mastery. The *relative* amount of reminiscence (per cent which the number of reminisced items is of the number in the whole list) might, on the other hand, grow progressively smaller as initial level of learning rises (**8**). Findings with a pursuit skill support this expectation (**11**).

Serial position. Ward (**68**, p. 38) compared amounts of reminiscence for items in positions 3-4-11-12 in a 12-item list with amounts for items in positions 6-7-8-9. Whether the list had been learned to one perfect recitation or to 7 out of 12 correct before the rest interval, items in the center of the list showed more reminiscence. This finding is supported by the work of Hovland (**32, 33**). Ward felt that in his experiment degree of learning could not be separated from serial position, and hence amount of reminiscence could not be related to serial position as such. Hovland (**32**), however, brought lists to about the same degree of learning by spaced and massed practice and thus was able to state (p. 218):

> The syllables in the central portions of the lists learned by massed practice represented, in terms of the criterion of recall score, the same degree of learning as did those in the lists learned by distributed practice. One series, however, (massed) showed much more reminiscence than the other. This type of evidence tends to suggest that degree of learning, *per se*, is not the fundamental factor determining reminiscence, although it is probably closely related to it.

This conclusion qualifies the generalization made concerning degree of mastery and amount of reminiscence by the present writer, for Hovland's finding emphasizes the fact that at any degree of mastery the experimental conditions may be such as to produce reminiscence or fail to produce it. On the other hand, the fact that an item is in a central or end position is supposed to be a determiner of the relative strengths of excitatory and inhibitory tendencies affecting it, so that serial position as such seems to be an indirect factor in the occurrence of reminiscence.

It may be well to examine a little more closely Hovland's statement that the massed and distributed practice conditions brought about the same degree of learning in his experiment. In his Table

5 (**32**, p. 217), are shown mean numbers of errors in the various syllable positions in immediate recall after learning to a criterion of 7 out of 12 syllables correct by both kinds of practice. For massed practice, the mean number of errors in positions 3-4-11-12 was .254, and in positions 6-7-8-9, .684. For distributed practice, the mean numbers of errors in the same positions were .246 and .551. Therefore the list learned by distributed practice was actually learned better (statistical evaluation of the superiority was not carried out), and although less reminiscence occurred in it, there still is a trace of the troublesome co-variable, degree of mastery before the rest interval.

Rate of exposure of items. Hovland (**33**) shows that there is little or no reminiscence (in mean recall scores) with serial anticipation learning of nonsense syllables at a 4 sec. rate, although at the 2 sec. rate, as mentioned previously, there is equally clear evidence that reminiscence does occur. The rate of exposure thus seems to be a significant variable in the determination of reminiscence. Melton and Stone (**55**), however, finding no reminiscence when they used a 2 sec. rate with adjective lists, stepped the rate up to 1.45 secs. Although the increase in rate of exposure tended to have three effects on the original learning thought essential by Hovland and Hull *et al.* (**38**) for reminiscence to occur, it still failed to appear. As suggested previously, it is possible that Melton and Stone employed a kind of subject matter where reminiscence should not occur under any circumstances—making a change in rate of exposure non-critical—or the difference between their results and those of Hovland may lie in the absence of the correction procedure on the part of *S*. Although there is thus some lack of clarity in the comparison of these two studies, it seems likely that where reminiscence occurs it will be greater in amount with the faster rates of exposure. The results of McClelland (**46**) and Shipley (**63**), although they show no reminiscence, are in line with this generalization.

Deese (**16**) points out that seemingly one of the essential conditions for the appearance of the phenomenon is the forcing of a rapid learning rate upon *S*. The necessity for the rapid rate may explain why Hovland (**34**) did not find reminiscence with his particular paired-associates anticipation technique, and why Deese found no reminiscence when her *S*s learned poetry in a relatively free set of circumstances (method of complete exposure), but it does not explain the Melton and Stone (**55**) results.

The rate of acquisition itself, as a variable in reminiscence, has not been studied. The data on degree of mastery, and inspection of certain results obtained by the reviewer (**10**), suggest that where the original learning is proceeding rapidly as mastery is approached the immediate recall is likely to be at a high level. The difficulty of the material learned (or perhaps differences in "learning ability") thus is a variable in reminiscence, for a high score in the control condition makes comparative improvement impossible after a rest interval. Conversely, where learning proceeds slowly to any mastery criterion, the immediate recall is likely to be poorer, and reminiscence can appear. The differences between syllable and adjective lists, and between long and short lists might be interpreted thus.

Amount of material to be learned. Although there are no well-controlled studies of reminiscence in which the amount of material to be learned was varied systematically, Hull *et al.* (**38**) have deduced (theorems 51–53 inclusive, plus corollaries) that the longer the list the greater the amount of reminiscence to be expected, as measured by both the number of items rising above the threshold of recall and the shortening of reaction latencies. Shipley (**63**), although he found no reminiscence, was able to show that retention over a rest interval was better the longer the syllable list memorized.

If we assume that distributed practice prevents the rapid accumulation of inhibitory tendencies, the disappearance of which during rest is basic to the occurrence of reminiscence, a study by Hovland (**36**) becomes pertinent here. He shows (Fig. 2, p. 275) that the mean number of failures to mastery at various syllable positions in a list is greater for massed practice than for distributed, and that the discrepancy becomes greater as the compared lists increase from 8 through 11 to 14 units in length. If the number of failures to mastery in massed practice is thought of as part of the picture of greater difficulty and also the greater number of re-enforcements necessary in learning by this method, it is evident that the amount of internal inhibition generated in the learning of longer lists by massed practice must be greater than for shorter ones.

Thus the prediction concerning the absolute number of items reminisced seems plausible, but there is no basis for a prediction that the *relative* amount of reminiscence will also increase; nor is there a basis for predictions concerning reminiscence as related to amounts of materials other than syllable lists.

Type of practice. Hovland (**32**) shows clearly that reminiscence is much more likely to occur if the learning is by massed rather than spaced practice. This is another demonstration of the importance of "forcing," although, as shown by Melton and Stone (**55**), massed practice even at a high exposure rate is not sufficient to guarantee that reminiscence will occur.

Length of rest interval between original learning and test. The maximum amount of reminiscence in nonsense materials apparently occurs from 30 sec. to 2 min. after the original learning (**35**, **68**). By about 10 min. retention is slightly poorer than immediately after learning, and by 20 min. it is definitely less. It is probable that the "optimum" interval depends upon a good many factors, *e.g.*, length of list (**38**, theorem 52 and corollaries 1 and 2, theorem 53) and type of material learned, but no studies have been done which permit definitive statements about its length. On the other hand, Deese (**16**) believes that it is likely to be relatively short.

The finding of reminiscence in mirror-tracing (**65**) at an interval of 24 hrs. is about the only clear suggestion that the phenomenon may occur over intervals longer than about 5 min. The drawback of Snoddy's study at present is the possibility that his *S*s rehearsed symbolically during the 24 hr. interval, but motor learning (including the pursuit tasks) seems quite likely at least to have a different optimum interval than verbal learning. Many studies apparently indicate that reminiscence can occur over longer intervals (**14**, **19**, **25**, **45**), including intervals up to 90 days in the work of English and his associates. All of these studies are open to criticism on various grounds, so that it is not justifiable to conclude that they demonstrate effectiveness of rest intervals of any length.

Theories of Reminiscence

Hovland (**32**) and other writers have reviewed several theories of reminiscence and discarded them as unsatisfactory. "Explanations" of the phenomenon have been based, for example, on the principle of perseveration, motivational changes, neural growth, recovery from fatigue, and recovery from refractory phase decrement. Apart from the lack of specificity and completeness of such formulations, it can be pointed out that fatigue, refractory phase decrement, etc., are conditions which may enhance gains during a rest period if they are present, but may be absent without thereby preventing the gains from occurring. Hovland's demonstration of reminiscence after only one presentation of a list is pertinent to this point.

Differential forgetting. The theory which now dominates the field of reminiscence has been developed by Hull and his associates and will be the only one reviewed in detail. As it pertains to the reminiscing of a single item, it is about as follows. In serial learning the presentation of successive items leads to the development of a chain of conditioned responses (**42**, **43**) to the sequence of compound stimulus traces (**38**, p. 41). There are also remote excitatory tendencies arising from the conditioning of stimulus

traces to the various responses of the sequence (**38**, p. 45). The tendency to give a response is (presumably) re-enforced by the visual occurrence of it; at the same time an increment in inhibitory potential, affecting the excitatory tendencies operative then, is generated (**38**, pp. 51, 82). The algebraic sum of excitatory and inhibitory tendencies is the strength of the effective excitatory potential (**38**, pp. 24, 39, 62). The amount of inhibition generated in a massed practice is greatest at the center of a list (**37**; **38**, p. 98), and therefore the strength of effective excitatory potential necessary to bring an item above the threshold of recall will be reached there later than at end positions.

The occurrence of reminiscence depends upon the more rapid loss of inhibitory than of excitatory tendencies bearing upon a particular response, during a period of no practice (**38**, pp. 65–69). An item just below threshold before the rest period may be reminisced because this differential in decay can, for a brief period, permit an effective excitatory tendency strong enough to bring the item above threshold (**38**, pp. 118–121, 256 ff.). The greater the amount of inhibition relative to the strength of excitatory potential before rest, the more chance there is that effective excitatory potential will increase enough to bring a response above threshold as decay of potential proceeds, provided of course that the total excitatory potential is great enough to permit this. Thus more reminiscent items are to be expected in central positions in the list than in end positions, and so on.

In the discussion of the relation between learning technique, subject matter and amount of reminiscence, it was indicated that there are three criteria as to the existence of more inhibition in one list than in another. Our first critical comment concerning the theory was incorporated in that discussion, since it seemed appropriate there. To repeat: the studies of Melton and Stone (**55**) and McClelland (**46**) show that these criteria can be satisfied, wholly or partially, without the appearance of improvement in a delayed recall. The direct dependence of reminiscence upon the disappearance of inhibition as inferred in this manner to be present has yet to be demonstrated. Because most of the theory depends upon this demonstration, it seems very important that more work be expended upon it.

The theory requires that remote excitatory tendencies arise during practice, and presumably they should be weaker than the direct excitatory tendencies. McGeoch (**49**), however, found no

indication of this in a retroactive inhibition experiment. This type of experiment does not indicate, in a manner which is crucial for reminiscence theory, just what happens to the remote tendencies, but it emphasizes again that the basic assumptions rather than the superstructure of the differential forgetting theory should be the most immediate topic of investigation. McClelland (**46**) has argued that error tendencies which *S* brings to an experiment, at any strength greater than zero, can not be treated by the theory.

The apparently greater tendency for reminiscence to occur in the center of a list rather than in end positions is considered to be proof of the fact that assumptions concerning the relatively greater amount of inhibition generated there are justified. Ward (**68**) has suggested that it actually is not possible to separate the effects of serial position as such and degree of mastery as such upon reminiscence. The occurrence of reminiscence in center positions might be due to the fact that this is the only part of the list not already mastered to a high degree. One can interpret the latter statement as Hull *et al.* (**38**) do, *i.e.*, the lower degree of mastery is due to the presence of inhibition, or it might be interpreted, as suggested by McClelland[12] by saying that *S* attends first of all to the end positions in the list and only later attempts to extend his memory span to center items. The interpretation is, then, that the concept of inhibition is not needed to explain serial position effects during learning, and the locus of reminiscence ought to be related to the possibilities of improvement at various positions in the list.

Although the actual occurrence of reminiscence in greater amounts in center positions is not to be doubted, for 12-item syllable lists, the reviewer has data (**10**) which do not show the tendencies exhibited by the shorter lists. They come from an unpublished study employing 16-item syllable lists. The Ward design was duplicated in all but two details—self-correction and pronunciation were required of *S*. All lists were learned to a criterion of one perfect trial before the immediate (6 sec.) recall or the delayed (2 min.) recall. The mean number of items recalled at the control interval for positions 7–12 inclusive was 4.94, and at the experimental interval, 5.61 ($t=1.97$; $P=.07$). The mean number of items recalled at the control interval for positions 3–5 and 14–16 inclusive was 5.39, at the experimental interval, 5.94 ($t=2.55$; $P=.02$). The mean gain was greater but less reliable statistically in the central positions (for the whole list, $t=3.01$; $P=.01$). The

[12] In unpublished seminar notes which he kindly loaned to the reviewer.

conclusion that gains are greater in central positions is further brought in question by inspection of Fig. 3 of Melton and Stone (**55**). Shown there are numbers of errors in various positions of a 16-item adjective list at the 6 sec. and the 2 and 5 min. recalls. The list was learned at a 1.45 sec. exposure rate, to a criterion of 12/16 before rest. Although, for the total lists, there was no reminiscence, it is clear in the graph that such reductions in errors as occurred in the experimental intervals were for items in positions 2–5 inclusive and 16, while the increases were largest in positions 8–11 inclusive. These results are just opposite those demanded by the differential forgetting theory. One can only conclude here, as in the discussion of the criteria of inhibition, that until the actual locus of the occurrence of reminiscence within a list is more adequately stated, and related to the possibilities for improvement, the theory is a superstructure built upon as yet insufficient experimental findings.

Perhaps the most difficult problem attacked in the monograph by Hull and his colleagues is the formulation of statements about the nature and origin of inhibition. The postulates merely state that an increment of inhibition occurs every time there is an increment in excitatory potential. "Inhibition of delay" and "inhibition of reenforcement" are both mentioned by the theorists (**38**, p. 51) as names for this type of deterrent to acquisition. As the writers themselves point out, such hypostatization is not satisfying. Although neither is explicitly incorporated in the system at present, two sources of inhibition are suggested.

The first (p. 54) is based on the assumption that when a tendency to say y as x begins to be established, the saying of y (conditioned) conflicts with the reading habit which produces the saying of x, the response to x thus being inhibited. McClelland (**46**, **47**) has developed this possibility further in his studies of discrimination learning, and speaks of it as a performance decrement. Essentially, McClelland's view is that during acquisition, especially if this is "forced," the true level of learning is not exhibited in *S*'s responses; a rest period reduces the amount of conflict and therefore performance improves. Such a statement will fit most of the facts fitted by the Hull theory, except, *e.g.*, the occurrence of reminiscence after only one presentation of a list (**32**), and it lends itself to motor learning and discrimination learning more readily than does the differential forgetting hypothesis. On the other hand, until a plausible interpretation of why conflict should be reduced

during a rest period is found, the theory is no improvement over one assuming inhibition of delay.

The other alternative is advanced by Hovland (**31**) and Gibson (**28**). The source of inhibition is conflict, again, but this time it springs from generalization on either the stimulus or the response side. The idea is attractive because it might bolster one of the weakest points about the whole system: it now is essentially a disuse theory of forgetting and as such is very difficult to integrate with findings on retroactive inhibition. Gibson has already demonstrated the wide range of phenomena to which the generalization-differentiation hypothesis applies, and if it can be developed to handle the question of why increases in differentiation occur during a period of no practice, it would be a much needed inclusion in the main body of Hull's system. Furthermore, it would be consistent with the interpretation of inhibition on the basis of competing reaction systems, as defended by Wendt (**69**) and Guthrie (**30**).

Köhler (**41**), with support in part from the work of Müller (**57**), has presented what seems at first to be a different type of reminiscence theory. It is based on the assumption that cortical traces of items which have been learned by massed practice have "halos" of current which interfere with differentiation between traces and therefore with recall; after a period of no practice these halos tend to be reduced, differentiation between traces improves, and recalls improves. Questions may be raised concerning these physiological speculations, and the lack of specific deductions for experimental test, but the interesting point is that in spite of "language" differences, the essential concept here, as in the differential forgetting theory, is intra-serial interference or inhibition. When the trace theory[13] is carried further, specific predictions from it may differ with those from the Hullian theory; until that happens, the two theories can not be considered mutually exclusive.

It will be noted that the criticisms of the differential forgetting theory are aimed not so much at the deductions from the theory as at its experimental foundations. Improvement of the theory depends first of all upon certain "low level" studies which deal with the measures of inhibition, the nature of remote excitatory tendencies, etc., and the empirical relation of these to the locus and amount of reminiscence.

[13] Another type of trace theory is developed by Martin (**53**). It is Lewinian (**74**) in character, but it is not discussed here because of its specificity to Martin's type of experiment (plus the fact that his results are open to question, as indicated in the discussion on experimental controls).

SUMMARY

Reminiscence has been defined as an improvement in recall, where all practice after the original learning has been ruled out, and it is proposed that for the present it should be studied apart from phenomena of the distribution of practice. It seems probable that reminiscence is a wide-spread occurrence, but there is little fully acceptable evidence of the validity of this statement. To date, reminiscence as a dependent variable seems to be related to the type of learning technique employed, the type of subject matter, degree of mastery before rest, type of practice (degree of distribution), length of rest interval, and probably to serial position, rate of exposure of items and the amount of material to be learned. The differential forgetting theory is clearly the most significant attempt to relate these findings. The criticisms directed at this theory have all dealt with its experimental bases and not with its general structure. The reviewer feels that the present status of our knowledge about reminiscence is such that we must emphasize the fact-finding phase of the fact-theory cycle. He also feels that the now-you-see-it-now-you-don't character of reminiscence research provides a challenging and at the same time promising area for future work.

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THE PSYCHOLOGICAL BACKGROUND OF INDUSTRIAL BROADCASTING

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Psychology as a dynamic science applying itself to many fields of human activity, frequently finds that it alone among the sciences can adequately evaluate and explain certain social and economic values to be derived from new technological developments. An electronic application which has become important during World War II and which may be expected to remain a part of the industrial scene after the war is the plant broadcasting system. Some of the most important problems associated with use of these systems are properly psychological problems. Since it is now reported (1) that hundreds of factories have installed industrial communication systems at costs ranging from $250 to $50,000, it becomes increasingly important that examination be made of the relevant scientific literature which will facilitate more comprehensive and efficient use of these systems. These plant public address broadcasting systems—frequently installed with studios resembling those of sizable radio stations—are used for broadcast of both spoken material and music.

The limitations of the scientific investigations in this field will be apparent from examination of this paper or from reading of industrial music research summaries (**22, 23**).

In the use of music alone, many problems face the industrial broadcaster—What kind of music is best for the employee doing a given kind of work? How frequently and for how long should music be played? Is the value of a given type of music constant throughout the work day? Would specially composed music be more effective in promoting euphoria and output than existing music of traditional types? While few studies throw light upon these and similar questions, available evidence, experimental and anecdotal, favor the generalizations that (1) Management appears to be in general agreement that music favorably influences output and happiness of workers. (2) Music should be adjusted to emerge at an

optimum intensity from the prevailing noise level. (3) Music is of most value to employees engaged in manipulative-dexterity and repetitive type work as opposed to employees engaged in work requiring intense mental concentration. Relief of boredom is one of its greatest values. (4) As yet there is no evidence that music facilitates the output of persons engaged in higher mental operations. (5) It is the general belief of persons working in the field that the employees' appetite for music should be kept sharp by playing music for relatively short periods (e.g. 15-20-minute) during those stretches of the work spell when boredom and fatigue are thought to be most intense. (6) Attitude surveys of industrial workers report strong beliefs in the desirable psychological effects of music. A "feelings about music" survey of 229 electrical workers receiving music found significant majorities who reported that music improved their feelings toward their associates, helped their nerves, helped them forget their worries, and helped them when tired or when doing wearisome, monotonous work. Factor analysis of these beliefs indicated that more than one attitude was being measured.

These remarks with reference to music have been made in order to help orient the reader to the general field of industrial broadcasting. This survey is concerned with the non-musical use of such factory broadcasting systems.

Carver (3) found auditory presentation to be more effective for simpler material and visual presentation more effective for more difficult material. This is in line with DeWick's (4) experimental conclusion, based on a well controlled study of 70 college students, that "Auditory presentation of advertising material is distinctly superior to visual presentation when the problem involved is the recall of products and their trade names after a delay of from five days to five months."

Chief non-musical values derived from use of such factory broadcasting systems are believed to be those related to maintaining closer and more direct contact between management and personnel, paging of key workers, making announcements and emergency calls, and improving employee morale by providing regular news broadcasts, programs of recognition, and other special programs. There is considerable reason to believe that such broadcasting (17) has a favorable effect on production. This paper attempts to survey research which may have theoretical or practical value for the improvement of current usage of industrial broadcasting systems.

One of the first model plant broadcasting system studio layouts is that which was planned and constructed at DePauw University

by Professors Fay and Middleton and a group of RCA engineers. While combined with an experimental psychology laboratory, the DePauw studios, described elsewhere (**10**), embrace many fine features which could well be reproduced in industrial studios. Model industrial studios include those at the Botany Worsted Mills, Passiac, N. J., and at RCA Victor, Camden, N. J. The usual equipment provides for sending different programs to different floors, work areas, and buildings. A paging call likewise may be restricted to a specific building or floor. Several speaker types are available.

Quality and Characteristics of Sound

Present evidence indicates that broadcast material should be carefully presented in order to receive positive affective responses from the working listeners. In a study of noises, Laird (**24**) found that they reduced production in a laboratory "factory" employing two workers. Varying noise and high pitch noise were both more detrimental than their opposites. While these were meaningless noises such as those produced by an audiometer, it is possible that the conclusion regarding pitch may be related to Cantril and Allport's (**3**) finding that male voices are preferred for most purposes. Rosenblith (**27**) reports that hearing loss due to industrial noises is localized almost completely in the region above 1500 cycles with a maximum at 6000 cycles. Speaker outlets in the various work areas of a factory should be adjusted to prevailing noise levels. It is reported by Halpin (**17**) that in the weave shed at Botany Worsted Mills where the noise level is 102 db "Management says air raid instructions, paging, and music are heard reasonably well." Such intense noise levels are not common in the average factory.

Characteristics of Announcers

Two studies (**3**, **9**) have indicated that male announcers are usually preferred over women announcers. Fay and Middleton (**9**) conclude with reference to their study on college students that "Some women are preferred to some men announcers, but only when the men have relatively unappealing voices . . . men are even preferred for advertisements of women's products." In a study of 1075 radio listeners, Cantril and Allport (**3**) obtained the following responses to these questions. "Which type of *male* voice do you prefer to hear over the radio?" Tenor 31%, baritone 62%,

bass 7%. "Which type of *female* voice do you prefer?" Soprano 25%, alto 75%. The same writers report that ". . . the public despises 'affected' voices and on the average program dislikes feminine announcers." They found in one experiment however that women announcers are preferred for reading poetry and reflective, abstract material.

Fay and Middleton (**5, 6, 7, 8, 11, 12, 13, 14, 15**) have found in a series of experiments that student listeners discriminate better than would be expected by chance between announcers on the specific traits of persuasiveness, intelligence, sociability, pleasantness of voice, enthusiasm, sales ability, and occupation. These listeners were also able, too often to be explained by chance, to detect lying from the voice as transmitted over a public address system. In a similar study by Herzog (**18**), 2700 Vienna radio listeners judged height, weight, age, sex, and occupation of each of several radio speakers more accurately than could be accounted for by chance. Bonaventura (**2**) used six speakers selected for Kretchsmerian morphological type and give their photographs to a large number of listeners. The auditors succeeded in matching photos with voice with considerable accuracy, pyknic being judged most accurately. Taylor (**28**) found a high degree of judge agreement in judging personality traits from voice.

Moses (**25**) has pointed out that in his clinical experience "the predominance of 'major' or 'minor' in the voice suggested predominantly optimistic or pessimistic attitudes." He also noted that in pleasure the inspiration tends to be short while the expiration tends to be long but that in displeasure the opposites are frequently true.

Significance of these and similar studies lies chiefly in the emphasis which they imply should be placed upon the careful selection and training of announcers. Most of these studies agree in finding that many voices are responded to as stereotypes.

When the announcer is to be "personalized," there is some evidence to support the adoption of career names when the announcer's original name is not pleasant. Walton (**29**) studied 285 men's and 298 women's names and found that the four men's names which are regarded as most pleasant are Robert, Richard, Jack, and Charles, while the four most pleasant for women are Jean, Jane, Virginia, and Dorothy.

Limited evidence indicates that the announcer should be a

male, but if the announcer must be female, she should possess an alto voice. If the announcer is to have control of the selection and arrangement of musical programs, he should have an appreciative knowledge of various types of music and he could profitably be trained in the measurement of the music preferences of employees. Editing ability for the arrangement of news bulletins is a definite asset.

Characteristics of Programs

Types of programs which have been suggested for various industrial situations include plant and company news, local, national and international news, sports news, special programs for national holidays, employee marriages, engagements, military enlistments, birthdays, local talent programs, regular recorded music programs, and educational programs. While the practicality of various nonmusical programs will be limited by the conditions of a given industrial situation, the determination of exactly what is most practicable in various situations is a fertile field for experiment. Paging of key personnel and making of announcements in both office and production sections of a factory are now common over these communication systems.

In broadcast of verbal material, Carver (3) found that passages in which a general idea was followed by a specific reference or concrete illustration were in every case more interesting and better recalled than either an entirely general or an entirely specific passage. Carver also concludes that short sentences have greater memory value when the material lacks intrinsic interest or is of a highly factual nature; length of sentence does not matter for interesting material. The same experimenter reports that "The majority of broadcasts are most comprehensible and most interesting when the speed is not less than 115 nor more than 160 words per minute." Factual or difficult material can be broadcast more slowly without losing its interest, but readily comprehended material (news, etc.) loses its interest and is therefore less well understood if broadcast at a rate less than 120 words per minute. In general, repetition facilitates comprehension and aids memory, though it runs the risk of making a broadcast less interesting. Most suitable length for most educational, factual, or news broadcasts is about 15 minutes. Carver declares that "findings tend to indicate that the listener's loss of interest in long talks tends to

counterbalance any intrinsic effectiveness gained by expansion in length."

Gaskill and Holcomb (**16**) conclude from their study of radio advertising that "More program content than advertising content is remembered . . . there is no relation between amount of time spent in advertising and its memory value . . . Greater memory value for advertising content seems to be directly affected by the ingenious 'sandwiching' in of advertising announcements. Complete isolation of advertising announcements, such as introductions and conclusions distinctly separated from the program seem to make for low memory value." It might appear from this that such utilization of the principle of affective assimilation could make ordinarily colorless or even unpleasant announcements or news seem somewhat more acceptable.

From a questionnaire study of 1,075 rural and urban Easterners equally balanced for sex, Cantril and Allport (**3**) found that in the rating of 42 types of programs, these ten stood highest in this order: old song favorites, dance orchestras, news events, symphonies, football, drama, humorists, sports, educational talks, psychology (latter two tied).

In the future, judging from present developments it will be possible to arrange an industrial broadcasting program with content types that will please practically all listeners. In a factor analysis of the preferences of 146 Princeton University students for 18 types of radio programs, Robinson (**26**) obtained three factor clusters (with item loadings greater than .40) as follows.

I. Drama factor: sports events, sports news, comedy and variety, dramatization of historic or scientific facts, dramatized news, dramatic plays, quiz programs.

II. Inspirational factor: forum talks and discussions, amateur hours, religious programs, news commentators, dramatized news, dramatizations of historic or scientific facts, folk and band music, serial stories, programs on personal problems, sweet dance music.

III. Unnamed factor: serial stories, programs on personal problems, serious music.

This same type of program type analysis should be made for industrial broadcasting programs. Although available evidence (**19, 20, 21**) seems to show that music programs are liked by an overwhelming majority of industrial workers, sports news, dramatic programs, and similar types probably have much less general appeal in the factory situation.

Summary and Conclusions

While many of the conclusions to follow are tentative and deserve further investigation, especially with specific reference to the industrial situation, it is believed that some of these findings may be subjected to immediate practical application.

1. Public address broadcasting systems, with central control studios, are useful in the industrial situation.

2. For presentation of non-complex material, the spoken word appears to be more effective than the written word.

3. Both meaningless noises and speech of high pitch seem to be less pleasant and less desirable to the average listener than speech or noises of a lower pitch.

4. Most listeners usually prefer to hear a male voice; tentative evidence indicates that even women prefer male voices.

5. Listeners regard many voices as stereotypes, tending to associate certain personality characteristics with certain voices.

6. Certain names are regarded as more plesant than others. While the affective weight of a pleasant name may not be great, the fact may justify adoption of pleasant names by "personalized" announcers.

7. Music probably stands highest in the list of favorite program types.

8. In broadcast of verbal material, passages in which a general idea is followed by a specific reference or concrete illustration are generally more interesting and better recalled than either an entirely general or an entirely specific passage.

9. Short sentences seem more effective for material lacking in intrinsic interest.

10. Optimum speed for most broadcast speech is probably between 115 and 160 words per minute.

11. Short announcements may be highly effective when "sandwiched" between pleasant stimuli such as music.

12. Programs, especially music, may be broadcast successfully through relatively high factory noise levels.

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McGEOCH'S PSYCHOLOGY OF HUMAN LEARNING

A Special Review

BY DAEL WOLFLE
University of Chicago

McGeoch, J. A. The psychology of human learning—an introduction. New York: Longmans Green & Co., 1942. Pp. xvii +633.

John Alexander McGeoch (1897–1942) received his Ph.D. in psychology from the University of Chicago in 1926 while a member of the faculty at Washington University, St. Louis. Two years later he became Professor of Psychology at the University of Arkansas and then, successively, chairman of the departments at the University of Missouri, Wesleyan University, and the University of Iowa. He was cooperating editor of the *Psychological Bulletin* from 1931 to 1934 and editor from 1935 to the time of his death. During the last dozen years of his life he was elected to a number of offices in regional and national professional associations.

McGeoch started contributing to the literature of psychology at the age of 22 with the publication of his Master's thesis: "The present status of psychology." From then until the writing in 1926 of his Doctoral dissertation ("A study in the psychology of testimony") his interests ranged over intelligence tests, imagination, suggestibility, perception of filled and empty time, and the fidelity of report of normal and subnormal children. From 1926 until his death practically all of his research work and publications were centered in the study of human learning. During this time he published some 60 articles, wrote chapters on learning for several texts and handbooks, and, as a final review of his chosen field, *The psychology of human learning.*

The book McGeoch wrote was not, however, the one he wanted to write and which he, probably better than any other psychologist was prepared to write. For years he had been reading, reviewing, criticizing, and abstracting the learning literature, intending some day to write a complete and definitive handbook of human learning.

Carr recounts, in the preface, some of the difficulties of that venture. McGeoch's chapters, Carr's extensive criticisms, and McGeoch's revisions accumulated too slowly, and were interfered with too much by McGeoch's ill health and by other demands on his time. Finally McGeoch decided to write a briefer introduction to the subject, a single volume which might be used as a textbook and which would give him the practice in organizing and condensing his voluminous notes which he wanted as a preliminary to the writing of the larger handbook.

The book which we have was therefore regarded by McGeoch as a textbook and as a predecessor to his major work. It consists of 14 chapters. The first two are general in nature, covering "Concepts and Methods," and "Curves of Learning." These two chapters define and illustrate a number of the concepts of learning and its measurement. The pervasiveness of learning, the difficulty of arriving at a rigorous definition of learning, mazes, nonsense syllables, methods of measuring retention, conditioning, association, motivation, the Vincent curve, plateaus, and different curve forms are some of the topics covered.

Then follow nine chapters devoted to discussions of specific learning problems. These are: "Intraserial phenomena," "Distribution of practice," "Learning as a function of the material learned and of certain modes of practice and presentation," "Learning as a function of chronological age, sex, and test intelligence," "Learning as a function of motive-incentive conditions," "Retention," "Conditions of retention," "Transfer of training," and "Fundamental conditions of forgetting." Each of these nine chapters contains a systematic factual summary of some aspect of learning. Most of the emphasis in each chapter is given to experimental findings, but in addition relevant theories and any methods of experimentation specific to that subject are described, and a little, but not very much, of the relations to other topics may be given.

Since each chapter is fairly complete by itself, they may be read in any order. A student interested in a particular topic can read the appropriate chapter without loss of understanding through having failed to read the earlier chapters.

The three final chapters, again more general in nature, are "Fundamental processes and conditions of learning," "Fixation and elimination: frequency and related variables," and "Fixation and elimination: the empirical law of effect." These chapters deal with a typical process of learning, analyzing it into a problem

situation, the discovery of an adequate solution, the fixation of the responses involved in this solution, and the elimination or inhibition of less adequate responses" (513). Trial and error, insight, the role of transfer, and the importance of contiguity are the most important topics in the first of these chapters. The two final ones discuss the roles of frequency and effect in determining which responses will become fixated and which will be eliminated or inhibited.

The book has two features which distinguish it from a book on learning that many another psychologist might have written. First is the restriction to the field of *human* learning. The differences in methodology, in empirical findings, and in theoretical explanations between human and animal learning are too small to permit the complete exclusion of animal data; every once in a while McGeoch slips in the results of an animal study. But throughout, he has tried to keep the discussion at the level of human learning. In so doing he has minimized or excluded entirely the treatment of conditioning, of maturation, of physiological studies of learning—fields in which most experimenters have used animal subjects.

The second distinctive feature, like the first, reflects McGeoch's own selective interest in learning. His interest, and the interests of those with whom he worked most closely and who had the greatest influence on his thinking—chiefly Professor Carr—were primarily empirical. In this respect McGeoch is a conscious follower of Ebbinghaus to whom he gives credit not only for starting the "systematic experimental study of human learning" but also for setting the pattern for much of the later work in the field.

The empirical interest which marked McGeoch's thinking determined to a very large extent the authors from whose work he drew in writing his book. Nearly half of the men most frequently quoted by McGeoch were, like himself, Carr's psychological children from the University of Chicago—Bunch, Hunter, Pechstein, Peters, Joseph Peterson, E. S. Robinson, Stroud, Warden, Waters, and others. A smaller group of frequently-quoted authors, mostly students and colleagues of McGeoch himself or of E. S. Robinson, are, to varying extents, the second-generation product of Carr's extensive influence. There are, of course, frequent references to the work of Ebbinghaus, Guthrie, Hilgard, Hull, Köhler, Müller, Thorndike, Woodworth, and one or two others who are necessarily quoted in any book on learning, but references to many compara-

tive psychologists who have contributed important learning studies are only infrequently made.

The result of this selection on McGeoch's part is a book containing much about retroactive inhibition, maze and nonsense-syllable studies, forgetting, memory traces and remote associations, the law of effect, and the like, but a book influenced much less than most recent volumes on learning by conditioners, behaviorists, physiologists, gestaltists, or mathematico-deductive theorists. Adherents of these varied interests and points of view will frequently find their work quoted by McGeoch, but in general just the results are given. The theoretical background responsible for the experiments is usually missing or only sketchily appended to a summary of results.

The book is much like McGeoch's own experimental studies in content, method, and point of view. While it resembles a research monograph in this respect, it is not really that; to think of it as merely a review of the author's own research is altogether too narrow a conception of its scope. Even though deliberately condensed it will serve the professional psychologist better than anything else available as a substitute for the larger and more complete handbook that McGeoch wanted, but did not have time, to write.

One can not read *The psychology of human learning* without a feeling of sadness, for in its author's death psychology has lost an able and vigorous worker, and psychologists a genial friend. Yet we may be glad that he was able to complete this summary of the field to which he had devoted the whole of an all too short professional career. McGeoch has given us, as his last contribution to psychology, a simple, clear picture, presented without adornment and without apology, of what he considered the most vital, most central part of the whole field of psychology.

NOTICE

THE FIFTY-FIRST ANNUAL MEETING OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION, SEPTEMBER 2, 1943

To Associates and Members of the American Psychological Association:

The *Preliminary Announcement* and *Call for Papers* is usually issued by the Executive Committee and the Program Committee in April. The Program of the Annual Meeting has usually been made up in May and June and published in the July issue of the *Psychological Bulletin.* These steps were carried through in 1942 although the meeting planned for Boston and Cambridge was subsequently cancelled and a skeleton meeting held in New York City to transact essential business.

At the Annual Meeting in New York City the Association voted: "That the next Annual Meeting be scheduled tentatively for Thursday, September 2, 1943 at Chicago, it being understood that it will be a skeleton meeting unless restrictions on travel are raised, that Council may change the plan by a declaration of emergency or by the exercise of interim powers, and that Council be authorized to name a local member of the Executive Committee."

The Program Committee, consisting of Harold Burtt, Chairman, Dael Wolfle, and the Secretary, has kept in touch with the Announcements of the Office of Defense Transportation and has engaged in a large amount of correspondence concerning the possibilities of an Annual Meeting. As a result of these activities recommendations were transmitted to Council for review.

It is the combined judgment of the Program Committee and Council that no Call for Papers should be issued for the 1943 meeting. It has been agreed that the only official program to be announced at this time will be the Annual Business Meeting on the afternoon of Thursday, September 2, at some point in the Chicago area to be determined later. The intent is that the meeting should be attended by Council and by Members in the vicinity whose presence would not place an added burden on the transportation facilities of the country.

Further announcements will be made by mail or through the *Psychological Bulletin.*

WILLARD C. OLSON, *Secretary*

PSYCHOLOGY AND THE WAR

Edited by

STEUART HENDERSON BRITT

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ARMY SPECIALIZED TRAINING PROGRAM
REVISION OF SELECTIVE SERVICE OCCUPATIONAL BULLETIN NOS. 10 AND 11

PERSONNEL RESEARCH IN THE ARMY

IV. THE SELECTION OF RADIOTELEGRAPH OPERATORS

BY STAFF, PERSONNEL RESEARCH SECTION, CLASSIFICATION AND REPLACEMENT BRANCH, THE ADJUTANT GENERAL'S OFFICE

The highly mobile character of the present war, with its necessity for maintaining communications, has created an unprecedented demand for radiotelegraph operators. They are needed in almost all of the Arms and Services, such as the Signal Corps, Infantry, Air Forces, Armored Forces, Cavalry, and Field Artillery. So great is the number required that nearly five per cent of the men taken into the Army are trained as radio operators. Naturally, only a small part of this total is supplied by men coming from civilian life with the needed skills. In times of peace, relatively few individuals make a livelihood in this field and the number of amateurs is not large. The Army, then, is faced with the problem of training the specialists that it needs. Therefore, because of the large numbers of men involved and the shortage which exists, the selection of radiotelegraph operators has become one of the most important problems with which the Personnel Research Section is concerned.

Stated in broad form, the problem is one of selecting men who can be trained to become efficient radiotelegraph operators in the shortest possible time. Viewed in the context of the Army situation, however, the apparent simplicity of the problem vanishes. A review of the most outstanding complexities is essential to an evaluation of the results reported later. These may be discussed under three main heads: first, securing adequate criteria; second, generalizing results from one branch of the Army to another or even from one training installation to another; and third, securing adequate control of the conditions under which the data for the evaluation of selection instruments are determined.

What are the characteristics of an "efficient" radiotelegraph operator? The answer to this question may vary considerably, even within a particular Arm or Service. Ability to send and re-

ceive code is certainly basic, but the qualifying speeds may go as low as 9 words per minute (w.p.m.) or as high as 25 w.p.m. depending on the kind of net in which the operator will work. Besides code, the student operator must learn a large amount of non-code material. This may include printing, typing, operation of typical radio sets, message procedure, use of other communication devices such as visual signaling, blinker, panels, flags, and pyrotechnics, use of camouflage and cover, identification of and defense against enemy aircraft, packing and moving equipment, reading maps and aerial photographs, sketching terrain features, and use of elementary cryptography. The non-code material taught in a course varies widely, depending on the purpose for which a particular group of students is being trained. It is thus impossible to define an "efficient" radio operator in general terms that would be applicable to all or even most of them.

Reported Reasons for Failure in Radio Courses and the Problem of Selection. In view of the speed with which radio operators must be trained, and the definite standards of excellence which they must attain, it is to be expected that an appreciable number of failures will result. This expectation has been fully realized, and emphasizes the need for improved selection techniques. Evidence on the relative influence of code failures and other sources of failure as reported by training organizations is useful in determining the amount of emphasis to be given to code in selection problems.

In one breakdown of reported cause of failure for 275 Air Corps Communications students who had been eliminated, it was found that about 63% were eliminated for code failure as compared with 16% for failure in other subjects. Another study was based on 406 failures and "washbacks" who failed to complete the training in the allotted time. Of this group, low code speed was given as the only reason in 31% of the cases, while failing grade in radio mechanics was the only reason given in 15% of the cases. Since, in this set of data, more than one reason for failure was given in many instances, it is worth noting that low code speed was involved in about half of the failures, while failing grades in radio mechanics appeared as a reason in about two-fifths of the cases. The remaining causes included mainly continued absence, hospitalization, and other situations not amenable to prediction.

Reports from other training centers indicate that the relative importance of mastery of code in determining success or failure is even greater than found in the studies reported. As a result, the efforts in selection have been primarily directed toward measuring aptitude for learning code. Mastery of code involves both the

ability to send and to receive. Attention has been focussed upon receiving, however, because ability to receive code is generally considered a prerequisite for learning to send, and because the two abilities are so closely connected that the number of students who pass receiving but fail sending is not large enough to warrant a specific attack on this problem.

Criteria of Success in Code Learning. Since the mastery of the International Morse Code is of such central importance in radio operator training, special interest attaches to the choice of a criterion of success in this skill. The urgency of the need for operators has led to an emphasis upon speed of learning code as the underlying variable to be estimated from the data available. The measures have taken two general forms: first, the amount of progress attained within a specified period of time; and second, the amount of time required to reach a given level of attainment.

A brief examination of the characteristic procedure in code training will aid in the evaluation of the criteria used. After a student has learned to identify the alphabet and numerals, he is advanced from speed to speed in roughly uniform steps. For example, a student who has qualified at the 5 w.p.m. speed, would be moved up to the 7 w.p.m. level, and would normally continue to advance until the end of the training period. Since students are usually passed or failed in code on the basis of the highest speed passed during the course, the final code speed attained is usually available. This criterion has been used in a number of studies. It produces however, a rather crude grouping of the observations, especially where the steps are large. It may suffer from a more serious difficulty, namely, that the number of hours of actual code training may vary appreciably within a group, because of illness, late assignments, and other causes. It is also more difficult to compare results from different schools which allow varying amounts of practice within the training program. A different form of this criterion provides code speed attained during specified intervals of time, as at the end of 4, 8, 12, and 16 weeks. While this provides additional data of some value, it does not escape the difficulties mentioned above.

It is apparent that a more refined measure would be provided by the number of hours required to attain the various levels of code performance, and this criterion has been used whenever such data have been obtainable. The results of a validity analysis are more complex, in that more correlations are determined, but these additional correlations are useful both in interpreting the study and in comparing results with other studies. A minor inconvenience of this criterion is that the validity coefficients are negative.

The second problem, that of generalizing results from one

branch of the Army to another, is apparent from the above discussion of variations in requirements of operators trained for different purposes. The third problem, that of securing adequate control of training conditions, is closely related to the second. If men are being trained for different purposes, it is natural that their training will vary. With regard to the teaching of the code material itself, the instruction will not vary as much as the above statement might lead one to expect, but sufficient variation does exist so that care must be exercised in the comparison of data from different installations.

The manner in which men are selected for training is the most important point to keep in mind in the interpretation of data. Almost without exception, the men given training as radiotelegraph operators are a selected group. They are chosen, first of all, on the basis of their score on the Army General Classification Test,* only those men in grades I, II, and III being chosen for training. For some types of radio operator training, still higher standards on AGCT are employed. Thus, individuals at the lower end of the scale on general mental ability are excluded. The correlation between scores on the Army General Classification Test and code speed is not high, but it is positive, and selecting men for training on the basis of AGCT scores tends to reduce the validity coefficients which are secured. A second selective factor that generally operates is selection of men on the basis of their score on the Radiotelegraph Operator Aptitude Test (ROA-1, X-1), to be described later, which is given to all men entering the Army who make a score of 80 on the Army General Classification Test. Only those men who have scored average or better on this test are generally chosen. In some instances, if many qualified men are available, only those scoring highest in the selective criteria will be trained. The practice of selecting men who are best qualified for training on the basis of measures of mental ability and code aptitude is an excellent one from the viewpoint of training, but its effect on instruments of selection is to make them appear less effective than they really are. This point must be kept in mind in appraising the results that have been secured in the studies reported in this article.

* The Army General Classification Test, given to all men entering the Army, serves as the general mental ability test for classifying men. On the basis of the score made, an individual is given an Army grade from I to V, I being high. Scores on all tests are translated into Army grades. The top three grades include about 70% of the men.

Tests Used in Predicting Speed of Learning Code. Since the Signal Corps Code Aptitude Test (now called the Radiotelegraph Operator Aptitude Test, or ROA) was already in use for selecting radio operators when the expansion of the Army began, initial efforts were devoted to an analysis of this test. Many requests were received from training organizations for information regarding this test and a number of units collected data on it.

ROA-1, X-1* is a specific aptitude test, which grades men on their ability to make auditory discriminations considered to be similar to those made by an air operator in receiving code. The test is somewhat the same in form as the Seashore Rhythm Test, except that the patterns of sounds which are to be judged "same" or "different" are patterns of typical code sounds—"dits and dahs." It is usually administered by means of phonograph records, but may be administered by use of tape recordings similar to those used in training operators, or even hand-sent by a skillful operator. The sounds are to be sent at a speed equivalent to a code speed at 20 w.p.m., and approximately 9 minutes are required for one presentation of the test. It will be noted that standard conditions are achieved only when the phonograph records are used.

Variation in item difficulty is produced by using sound patterns whose lengths range from 2 to 13 sounds and whose members differ, with the difference occurring at varying points within the pattern. The test contains 78 pairs of code patterns. Its reliability, estimated by Kuder-Richardson formula #21, is approximately .75. Studies reported in this article, except where otherwise noted, are based on a single administration of the test. However, in view of the shortness of the test and its low reliability, the test is now repeated with a two-minute interval between repetitions. At the present time, this double administration of the test is standard procedure in reception centers, and every man inducted into the Army who makes a score of 80 on the Army General Classification Test takes the test in this form.

The validity of the ROA has been investigated in a number of studies. However, most of the earlier studies included both experienced and inexperienced students. Evidence now available, some of which is reported later in this article, indicates that where an appreciable number of experienced operators are included in a study, the obtained validity of the test is markedly higher than that obtained when only inexperienced men are included. From a practical viewpoint, the main function of a selection test for radio

* ROA-1, X-1 indicates the first form of the Radiotelegraph Operator Aptitude Test. X-1 indicates the first experimental form of form number 1. Various forms of a test are numbered 1, 2, 3, 4, etc., and subsequent revisions of a form are indicated as X-2, X-3, X-4, etc. When no more revisions of a test are contemplated, that is, when a test has passed out of the experimental stage, the X symbol is dropped.

code operators is to pick promising men (skilled men would be selected in any case); and from a statistical viewpoint, a population containing a mixture of experienced and inexperienced men is not homogeneous. Consequently, analyses of tests for the selection of radio operators now treat these two groups of students separately.

In an effort to obtain a test which would be more effective in selecting inexperienced men who would learn the code rapidly, various forms of a Code Learning Test have been devised and tried out. Essentially, the Code Learning Test involves teaching the student a portion of the code, and then testing his degree of mastery. Nine forms of the test have been formulated. In these forms, the method and amount of practice is varied, and on some forms, characters which have not previously been practiced are introduced into the test. The test is given from recordings played over a public address system or through earphones. Description of two of the forms follows:

CLT-2, X-3 begins with a learning period of 30 minutes during which the code characters for 6 punctuation marks are given. During part of the learning period a code character is announced and then presented. During the remainder, the code characters are presented in random groups followed by a voice which identifies each character. There are 180 items in the practice period. The test proper consists of 100 items. In it, each of the 6 characters learned during the practice period is presented 12 times together with 28 unlearned characters, all in random order. The examinee responds by recording the symbol for a character if it is one he has learned, or by a zero (0) if it is one not learned during the practice period. The reliability of this form of the CLT estimated by the split-half technique and Kuder-Richardson method is in the high .90's.

In CLT-3, X-4, 5 characters are learned, each associated with the number 1, 2, 3, 4, or 5, and responses in the test are recorded on a 5-place answer sheet for machine scoring. Practice test items are interspersed in the learning period, but the examinee has no opportunity to check the accuracy of his responses. One hundred items are presented during the learning period. The test itself consists of 105 items made up entirely of the 5 characters presented during the learning period. In all forms of CLT, the score is the number right.

Two other tests concerned with code and code characters have been used in studies of radio operator selection. The first of these is the Substitution Test, a paper and pencil test involving the learning of paired associates. The key contains 10 symbols, each with a corresponding letter. The test consists of filling in beneath each symbol in the test the letter with which it is paired. During a practice period of 3 minutes the subject can practice on 100 items.

The test itself, which has a time limit of 5 minutes, contains 209 items. Scoring is based on the number of correct responses. The reliability is in the high .90's.

The Code Rhythm Test is based on the Thurstone Rhythm Test and measures the ability of an individual to differentiate between the dots and dashes used in code and to remember code patterns of varying length. There are 5 short sample items and 45 test items with patterns consisting of from 5 to 13 dots and dashes. By use of a simple system of symbols, the subject reproduces each sound pattern presented. The score is the number of elements correctly recorded.

Studies on Radiotelegraph Operator Selection. In reporting the work that has been done on the selection of radiotelegraph operators, the discussion will concern 5 studies. These include most of the aspects of the problem already investigated. Several, and in some instances many, studies have been made on each of the specific problems discussed. Results of studies not reported are in substantial agreement with those presented. Material from other studies will be brought in when it is necessary to supply additional information.

The first study is the relationship of three tests used in radio operator selection (the Code Learning Test-3, X-3, the Substitution Test, and the Code Rhythm Test) and the relationship of each to previous radio operator experience and to education. Four hundred and seventy Air Corps Communications students were used in the study, but not all of the men took all of the tests so that the numbers of cases on the intercorrelations vary from 149 to 312. Experience in code was secured from a questionnaire on which levels of experience were assigned 1-point values from 0 to 6. Each subject checked the statement which best described his own level of experience. The 0 value statement was "Never had any experience with code," the 6th level "Have been a licensed operator." Those men with experience in code were asked to indicate their maximum speed of receiving.

The reliability of all three tests was found to be high, being .95 or above as estimated by the Kuder-Richardson method. The two estimates of experience (self-rating on the 7-point scale and estimated maximum speed) correlated .63. As might be expected, the Code Learning Test-3, X-3 and Code Rhythm Test showed a rather high correlation (.54) with each other, and both tests showed rather low correlations with the Substitution Test (.24 and

.09 respectively). Estimated experience correlated about .40 with the two auditory tests but negligibly with the Substitution Test. The correlations involving experience were about the same when the 7-point scale was used as when estimated code speed was used. The correlations involving years of schooling turned out to be uniformly low, varying from −.12 to .12. The selected character of this group is indicated by the fact that for highest school grade completed, the mean was 12.54 and the standard deviation 1.68. (In another study of 1203 students, where the mean number of years of education was 10.65 and the standard deviation 2.40, the correlation with the radio operator course grade was only .23).

A second study, done in a different training center, permits the comparison of CLT-2, X-3 with the Substitution Test. The tests were validated against time to reach various levels of proficiency in receiving code (4, 8, 12 and 16 w.p.m.). There were 217 cases at the beginning—all students in the radio operator course. Of the total, 174 had no previous experience in code, while 43 had had some experience in receiving and sending. Estimated receiving speed for the latter group ranged from 4 to 15 w.p.m. For the computations, all experienced operators were grouped. Both groups of tests had estimated reliabilities of .97 for the total group. The correlation between this code learning test and the substitution test turned out to be .39 for the inexperienced group, .54 for the experienced, and .42 for the two sub-groups combined.

Table 1 shows the correlation coefficients between scores on the 2 tests and criteria of number of hours to receive code at 4 different speeds.

TABLE I

CORRELATIONS BETWEEN SCORES ON CLT-2, X-3, AND SUBSTITUTION TEST WITH CRITERIA OF NUMBER OF HOURS TO ATTAIN 4, 8, 12, AND 16 W.P.M., RECEIVING, FOR STUDENTS IN RADIO TELEGRAPH COURSE.

	4 w.p.m.			8 w.p.m.			12 w.p.m.			16 w.p.m.		
	*I	*E	*C	I	E	C	I	E	C	I	E	C
CLT-2, X-3	−.46	−.63	−.68	−.44	−.60	−.65	−.38	−.59	−.60	−.42	−.56	−.57
Sub. Test	−.24	−.30	−.27	−.24	−.35	−.29	−.20	−.33	−.26	−.20	−.37	−.27
N	174	43	217	170	43	213	166	44	210	160	43	203

* I = Inexperienced; E = Experienced; C = Combined.

This comparison indicates that the Code Learning Test-2, X-3 is distinctly superior in validity to the Substitution Test. It is also apparent that the validity of the CLT in the combined group is satisfactorily high, ranging from −.57 to −.68. In interpreting these coefficients, it should be noted that students who were dropped for code failure before completing any particular code

speed were necessarily omitted in making the calculations. When inexperienced students only are considered, the validities are noticeably poorer, although high enough to justify further consideration of this type of test. The higher correlation in the combined group has appeared consistently in other studies of code learning and is to be expected. The mean score made on CLT-2, X-3 by the experienced men is significantly higher than that made by inexperienced men (C. R. = 3.8), supporting the views that the combined group is not statistically homogeneous.

In a third study, scores on Code Learning Test-1, X-1,* preference for receiving training as a radio operator, and experience in playing a musical instrument were evaluated in relation to the number of hours needed to attain a specified code speed (receiving). Musical experience was studied in relation to code learning as several instructors had noted that men who could perform on musical instruments learned code more readily than those who could not. Instructors also had stated that lack of interest appeared to be one of the chief reasons for failure in radio operator courses. Two hundred and three cases were included at the start of the study, none of whom had had any experience with code, and no cases were included that were dropped for any reason other than failure to develop code speed. All had made scores of 50 or above on Code Learning Test-1, X-1 and 90 or above on the Army General Classification Test, thus placing them in Grades I, II, or III. They were thus a highly selected group as is indicated by the fact that of a group of 2096 men scoring Grade III or above on the Army General Classification Test, about 35% made a score of 50 or above on Code Learning Test-1, X-1.

Coefficients were computed between scores on the Code Learning Test-1, X-1, and hours to attain code speeds of 2, 5, and 8 words per minute. These were −.46, −.48 and −.41 respectively. Only 90% of the group beginning the training reached the code speed of 8 words per minute, the rest having been dropped for failure to develop code speed. The validity coefficients are almost the same as those reported for CLT-2, X-3 for inexperienced men in the preceding study, indicating that this kind of test is also a

* CLT-1, X-1 is identical to CLT-2, X-3 (described above) in form and administration, the difference between them being the code characters to be learned. Four out of six of the characters in the two tests are different although the number of elements in each is the same and the two sets are of approximately equal difficulty.

fairly promising measure of ability to develop code speed. The correlation between score on the Code Learning Test-1, X-1 and the General Classification Test was .20. It is true that the group was selected on the basis of the Classification Test score, but the low correlation coefficient does indicate that within a group selected in this way the two tests are largely independent.

Musical instrument experience was defined as ability to perform on musical instruments before groups. The biserial correlation between musical instrument experience and time to receive code at a speed of 8 w.p.m. was −.24, an unreliable value, being only about twice its standard error. The number of hours necessary to reach this standard of 8 w.p.m. is about 5 hours for those without musical experience, but the amount of overlapping was so great that little significance can be attached to this fact. A biserial correlation of musical instrument experience with a score on Code Learning Test-1, X-1 of .40 indicates that if selection is made of men on the basis of the Code Learning Test, individuals with musical instrument experience are more likely to be chosen for training, even if no direct consideration is given to that characteristic.

Preference for receiving training as radio operators was indicated by the students at the completion of the Code Learning Test. They had at least some idea as to the kind of work involved in mastering code. However, the biserial correlation of preference (and non-preference) was small and unreliable both for code speed and for code learning test performance. This result suggests that *initial* preference is not a dominant factor either in test performance or in later mastery of the code.

Related data on the relationship between musical ability and code learning were secured when the Seashore Tests of Musical Talent were administered to two groups and the scores correlated with code speeds (receiving) developed after specified numbers of weeks of practice. With few exceptions, the resulting coefficients were positive, but all were low, those with the tests on Pitch and Rhythm tending to be higher. These, however, were lower than the correlation coefficients generally secured with the Radiotelegraph Operator Aptitude Test (ROA-1, X-1) or any of the Code Learning Tests. The Seashore Tests show about the same correlation to code speed that exists between code speed and experience on a musical instrument. Neither is sufficiently high to justify its use in the selection of radio operators.

A fourth study, in which records were kept on time to attain

code speeds of 4, 8, 12, and 16 w.p.m. for 8 different classes in the same installation, makes possible a comparison of Radiotelegraph Operator Aptitude Test-1, X-1 and Code Learning Test-2, X-3 as predictive devices. The classes varied in size from 66 to 272 men, including in all 1365 cases. All men took ROA-1, X-1 twice and the sum of the scores on the two administrations is used as the score. Three of the classes were given CLT-2, X-3 twice and the average of the scores of the two administrations used. The other classes were administered the test only once. For two classes correlations were computed between time to attain code speed at various levels and scores on single and double administrations of the CLT-2, X-3.

All of the students in the study were without previous experience in code. In all classes but one, the number of men on whom data were available decreased as the class progressed to higher code speeds. The percentage of failures, however, was not great, varying from 5 to 10 per cent of the men starting in each class. A summary of the data is shown in Table II.

TABLE II

MEAN TEST SCORES AND CORRELATION COEFFICIENTS OF CLT-2, X-3 AND ROA-1, X-1 WITH HOURS TO ATTAIN CODE SPEEDS (RECEIVING) OF 4, 8, 12, AND 16 W.P.M. FOR 8 CLASSES OF RADIOTELEGRAPH OPERATORS. (INEXPERIENCED MEN ONLY)

Class No.	N†	4 w.p.m.		8 w.p.m.		12 w.p.m.		16 w.p.m.		Mean Scores†	
		CLT	ROA	CLT	ROA	CLT	ROA	CLT	ROA	CLT	ROA
1	240	−.40	−.38	−.38	−.32	−.36	−.30	−.40	−.25	43.16	101.07
2	162	−.45	−.30	−.33	−.33*	−.34	−.32	−.33	−.28	51.87	109.13
3	187	−.53	−.24	−.44	−.29	−.35	−.24	−.33	−.26	52.13	110.17
4	272	−.34	−.11	−.36	−.20	−.37	−.16	−.28	−.14	41.31	106.91
5	190	−.40	−.31	−.34	−.34*	−.32	−.41*	−.29	−.33	52.24	111.37
6	102	−.46	−.11	−.49	−.17	−.55	−.19	−.56	−.13	37.67	110.50
7	65	−.55	−.33	−.54	−.58*	−.49	−.48	−.54	−.53	59.77	114.29
8	127	−.49	−.34	−.44	−.21	−.32	−.13	−.22	−.14	39.77	107.35
Median		−.46	−.30	−.41	−.30	−.36	−.27	−.33	−.25		

* Indicates ROA-1, X-1 coefficients that are higher than corresponding CLT-2, X-3 coefficients.
† Number of cases and mean scores of students passing 4 w.p.m.

In this study, as in others that have been conducted, the Code Learning Test correlates more highly with code speed at various levels than does the Radiotelegraph Operator Test. In only a few cases is the coefficient of code speed with ROA-1, X-1 equal to or higher than the corresponding coefficient for CLT-2, X-3. The range of correlation coefficients computed with scores on each test at each criterion level varies widely. Within each class, however, the coefficients are relatively consistent from one code speed to another. This would indicate that the differences which resulted

were due to differences among the classes themselves, a fact which is borne out by the wide variation which exists in the initial mean scores made on both the tests. It is possible that criteria were used in selecting the men that were not reported with the data, or that were impossible to determine. Thus, when one class was formed, men with high scores on the Army General Classification Test might have been available; at another time, men with higher scores on the Radiotelegraph Operator Aptitude Test. Other things being equal, the best men available for any training are always taken, and due to varying demands, the calibre of the available men on different measures varies from one week or month to the next.

In the two classes where correlation coefficients were computed between the validity criteria and the sum of scores on two administrations of CLT-2, X-3, the validity of the test was increased by an amount ranging from .02 to .08, except for one coefficient which dropped .01. On the whole the gain in validity was judged insufficient to justify the repetition of the test.

Intercorrelations of scores on CLT-2, X-3 and ROA-1, X-1 computed for the various classes varied from .25 to .56. Again, the range of coefficients is wide. In other studies, the correlations of scores between the two tests have hovered around .40, indicating some degree of overlapping between the tests. Multiple correlation coefficients for the various groups are not markedly higher than the CLT validities.

The code learning test, which attempts to sample the job involved in the training itself, appears to be definitely the most promising approach at present to the problem of selecting inexperienced men who will master the code most rapidly.

The last major study reported in this article was concerned with a determination of tests that would be useful in predicting grades in electrical courses, given as part of the radio operator training, as well as code speed. Scores on 28 tests, grades in 5 electrical courses, 1 mathematics course, and code speed at 8 weeks (receiving) were secured on a group of 86 students in a communications course. The tests on which scores were available included the Army General Classification Test, Radiotelegraph Operator Aptitude-1, X-1, the Seashore Tests of Musical Talent (already commented on), four mechanical information tests, viz. Shop, Electricity, Physics, and Mathematics, United States Employment Service Test, C-40-A, from which part scores on radio and electricity were secured, Physics test (Columbia), 5 tests from the Thurstone tests of pri-

mary mental abilities, 3 Brother Phillip tests, and several tests on surface development and mechanical movements. Electrical course grades were on the following: Direct Current, Alternating Current, Transmitters I, Transmitters II, and Receivers. Course grades were used as validity criteria for non-code materials of radio operator courses.

Correlations were computed between all the tests and code speed at eight weeks. The highest value was with ROA-1, X-1, the coefficient being .59. The number of experienced men in this group is not known. The Letters Test* (an Air Corps Test) correlated .40 with code speed. The Seashore Pitch and Rhythm tests both were .39. Correlation with Number Span Test (Brother Phillip) was .33, with Sustained Attention Test (Wittenborn)* and Seashore Tonal Memory, .31. All the rest of the coefficients were below .30, and with but one exception, all positive. AGCT correlated .16 with code speed in this group, but the sample on AGCT was highly selected. Correlation with the four electrical tests* ranged from .05 to .21, giving further evidence of the lack of relationship between the code and non-code aspects of training indicated in the reasons for failure reported earlier in the article.

Correlations also were computed between all the tests and the five course grades. Eleven of the tests showed promising correlations with electrical course grades, so additional coefficients were computed between them and the average of the five course grades. The eleven tests showing best relationship with grades in electrical courses ($r = .41$ to $.68$) were the Army General Classification Test; Mechanical Movements (Air Corps); General Electrical Information (Signal Corps); United States Employment Service, C-40-A Radio (part score); C-40-A Electricity (part score); C-40-A (remaining parts); the mechanical information tests, Shop, Physics, Electricity, and Mathematics; and Physics (Columbia). Of these eleven, four—the Army General Classification Test, C-40-A (Radio), mechanical information, Electricity and Mathematics sections—gave a multiple correlation coefficient of .75 with the average grade of 5 electrical courses. The four tests can all be

* The Letters Test is a verbal digit-symbol test, in which the letters of the alphabet are given verbally to the subjects who record the code symbols for these letters. In the Sustained Attention Test the subject is required to check in a specified manner combinations of vowels and consonants presented irregularly. The four electrical tests are: Radio and Electricity (part scores from C-40-A), Electricity (one of the mechanical information tests—devised by the Air Corps), and General Electrical Information, a Signal Corps test.

administered in 90 minutes. Of this time, 40 minutes is devoted to the General Classification Test, which is given to all men entering the Army. The other three tests, require only 30 minutes actual testing time.

Summary

The United States Army requires, in the building up of the armed forces, many radiotelegraph operators. The number needed far exceeds the available supply and has necessitated setting up a selection program to identify those men with aptitude for radio telegraphy. Training consists of both code and non-code material, which appear to involve different aptitudes. Inability to develop acceptable speed in code is by far the most common reason for failure in radio operator courses. The second most common reason for failure is a low grade in radio mechanics course.

All the data on the problem have been collected in various installations throughout the country and sent to the Personnel Research Section for analysis. Collection of data has been complicated by such factors as the difficulty of securing adequate validity criteria, generalizing results from one branch of the Army to another, and securing control of conditions under which data are collected. The selection of men for training on the basis of scores on the Army General Classification Test and the Radiotelegraph Operator Aptitude Test-1, X-1 that is generally followed has tended to reduce the value of the validity coefficients that are secured and make the tests appear less valid than is probably the case.

Code Speed and Code Tests. The two tests that have been most used in selection are the Radiotelegraph Operator Aptitude Test (ROA-1, X-1), an auditory discrimination test, and various forms of the Code Learning Test, a work-sample test. On the basis of data which have been collected, the Code Learning Test is the better of the two instruments. It is highly reliable (in the high .90's) and possesses considerable validity in terms of the development of code speed, the validity coefficients being generally in the .40's. The ROA-1, X-1 Test is only moderately reliable (in the .70's) and is less effective as a predictive instrument, the validity coefficients with code speed being generally in the .30's. ROA-1, X-1, shows definitely improved reliability and validity when administered twice, and this procedure has been made standard.

Both of the tests will yield rather high validities for groups

which are heterogeneous as to previous code experience, since experienced men do better both on the tests and in the learning situation. The tests perform less well for men without any previous experience in code. Correlations between the two tests have varied markedly in different groups but appear to cluster in the low .40's.

Code Speed and Other Measures. There seems to be little relation between years of education and ability to attain code speed. Initial interest in receiving training appears to have no effect on ability to score on the Code Learning Test-1, X-1, and little effect on the number of hours needed to attain various code speeds. Musical instrument experience is related slightly to ability to develop code speed. The relationship, however, is too low to justify giving it special consideration in selection. Since men with musical instrument experience tend to make higher scores on the CLT-1, X-1, they have a greater chance of being selected for training than those without such experience. Scores on the Seashore Test of Musical Talent show some relation to code learning, but other measures have been found to be better adapted to the problem.

Speed in code apparently bears a low but positive relationship to mental ability as measured by the Army General Classification Test. The groups in which this relationship was studied were composed of men drawn from the upper end of the grade scale on mental ability tests which would tend to reduce the value of the resulting coefficient. The relationship between speed in code and tests on electricity, mathematics, mechanical information, physics and the like, is low, but generally positive.

Non-Code Material and Various Measures. Validity criteria for the non-code materials were grades in courses dealing with the non-code aspects of radiotelegraph operator training. Correlations between scores on ROA-1, X-1 and scores on non-code courses were all positive but low. Scores between the Army General Classification Test and non-code course grades were all higher than that with code speed, ranging from .23 to .50. Eleven tests were found which related rather highly to grades in non-code courses, and which intercorrelated among themselves moderately well. Four were selected which gave a multiple correlation coefficient of .75 with average grade in five electrical courses.

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EVANS, J. E., Department of Psychology, Iowa State College, Ames, Ia., E.S.M.W.T. (Psychol. in Mgt.); Research, N.R.C., Civilian Aircraft Pilots.

*GESELL, ARNOLD, 14 Davenport Avenue, New Haven, Conn., Member Advisory Committee on Day Care of Children of Working Mothers (Children's Bureau).

HELD, LT. OMAR C., USNR.

*HENRY, FRANKLIN M., University of California, Berkeley, Cal., Research.

HEWSON, LOUISE R., Neurological Institute, New York, N. Y., Research Psychologist, N.R.C., Study of Head Injuries.

HOROWITZ, EUGENE L., Area Study Section, Bureau of Intelligence, Office of War Information, Washington, D. C., Analyst.

[1] This list supplements those published in the *Psychological Bulletin*, 1942, **39**, 385–403, and 631–633.

* Indicates part-time.

HUNT, LT. WILLIAM A., USNR (erroneously reported as 1st Lt., AUS, this Journal, June, 1942, page 395).

JANUS, SIDNEY Q., Social Security Board, Atlanta, Ga., Regional Occupational Analyst.

JENNESS, 1ST LT. ARTHUR FREEMAN, Army of the United States.

KENDALL, ENSIGN WILLIAM, USNR.

KLEIN, GEORGE STUART, Psychological Research Unit No. 1, Nashville Army Air Center (A.A.F.C.C.), Nashville, Tenn., Psychological Assistant.

KROUT, MAURICE H., 823 Dobson, Evanston, Ill., Psychological Examiner, Milwaukee Induction Station, Milwaukee, Wis.

KURTZ, ALBERT K., Psychological Corporation, 522 Fifth Avenue, New York, N. Y., Project Director of a Defense Research Project.

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LEHNER, LT. GEORGE F. J., Army Air Forces.

LODGE, LT. (jg) GEORGE T., USNR.

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*MACHT, MARTIN B., Department of Physiology, Johns Hopkins Medical School, Baltimore, Md., Psychological Examiner.

MADDEN, ENSIGN WILLIAM F., H-V(S), USNR.

MCCOLLOM, 1ST LT. IVAN N., Army Specialist Corps.

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MILLER, CAPTAIN NEAL E., Army Air Forces.

MILLER, LT. VERNON L., H-V(S), USNR.

MITCHELL, LT. (jg) MILDRED B., W-V(P), USNR.

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NEUBERG, MAURICE J., St. Taris Park, R.D. No. 2, Springfield, Ohio, Civilian Administrator, Engineering Maintenance Officers Training School, Tateson Field.

NEWLAND, LT. T. ERNEST, USNR.

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*PAYNTER, RICHARD H., Long Island University, Brooklyn, N. Y., Testing Applicants for the Civilian Pilot Training Course.

PERIN, C. THEODORE, 430 West South Street, Hillsboro, Ohio, Personnelist, Occupational Standards Unit, Civilian Personnel Branch, Air Service Command, U. S. Army Air Forces.

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RAINES, 1ST LT. LESTER, Army of the United States.

*ROSEN, ESTHER KATZ, 239 West Allen Lane, Philadelphia, Pa., Interviewing Applicants for Women's Army Auxiliary Corps.

ROTHNEY, 1ST LT. JOHN W. M., Army Air Forces.

RUSMORE, ENSIGN JAY T., USNR.

*SCOTT, WALTER DILL, 1729 Chicago Avenue, Evanston, Ill., Chairman, Solid Fuels Advisory War Council.

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SOLOMON, RICHARD L., Department of Psychology, Brown University, Providence, R. I., Research.

SPEER, GEORGE SCOTT, Recruiting and Induction Station, Fort Sheridan, Ill. Psychologist.

STEIN, LT. SEYMOUR P., Army Air Forces.

STOGDILL, LT. (jg) RALPH M., U. S. Maritime Service.

SWITZER, CAPTAIN ST. CLAIR A., Army Air Forces.

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TYSON, 1ST LT. ROBERT, Army Specialist Corps.

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*WAGONER, LOVISA C., Mills College, Oakland, Cal., Consultant for Nursery Schools, War Recreation Authority.

*WARDEN, CARL JOHN, Department of Psychology, Columbia University, New York, N. Y., Director of Research Project.

WARNER, LUCIEN, Special Services Division, Office of War Information, Washington, D. C.

WARREN, CAPTAIN NEIL D., Army Air Forces.

WOODRING, 1ST LT. PAUL, Army Specialist Corps.

WRENN, LT. C. GILBERT, USNR.

YOUTZ, 2ND LT. RICHARD PARDEE, Army Air Forces.

PSYCHOLOGISTS IN THE NAVY

BY C. M. LOUTTIT
Lieutenant Commander, U.S.N.R.

In October, 1940, when the writer first reported for active duty at the United States Naval Medical School, he was the only psychologist on active duty in the Navy. At that time plans were being made to use a limited number of psychologists as members of psychiatric examining units at Naval Training Stations. Beyond this program there were no systematic plans for utilizing psychologists.

Today (February, 1943) the situation is quite different. As will be seen in the accompanying table, over one hundred and thirty psychologists, including women in the WAVES, are being used in several different programs. The numbers indicated can be taken only as approximate because of almost constantly changing conditions. Very probably there are some additional psychologists in the Navy who are not engaged in psychological work, but of these we have no record. In at least one case a psychologist, Ensign James S. Maddox, in command of an Armed Guard crew, has been reported as missing in action.

PSYCHOLOGIST OFFICERS IN THE U. S. NAVAL RESERVE

BUREAU OF NAVAL PERSONNEL:

Washington:

Training Division:
Standards and Curriculum Section—7 men, 2 women.
Quality Control and Liaison Section—2 men.

Field:

Training Stations:
Selection Office—18 men, 2 women.
Operating Bases (personnel work)—6 men.
Schools (teaching)—4 men, 1 woman.

BUREAU OF MEDICINE AND SURGERY:

Washington:

Aviation Medicine Research Division:
Aviation Psychology Section—6 men.

Field:

(Psychiatric Examining Units), Naval Training Stations and Marine Corps Barracks—30 men, 1 woman.
Aviation Cadet Selection Boards—25 men.
Pre-Flight Schools—4 men.
Naval Reserve Aviation Bases—17 men.
Naval Air Stations—8 men.

BUREAU OF SHIPS:

Washington:

Officer Personnel Office—2 women.

OFFICE OF NAVAL OPERATIONS:

Washington:

Director of Naval Communications—7 men.

WOMEN PSYCHOLOGISTS IN THE WAVES, SPARS, AND MARINE CORPS (W-R)

BY MARJORIE K. BREMNER
Ensign, United States Naval Reserve

The Women's Reserve of the United States Navy numbers among its officers many who have been trained in the field of psychology. These officers are working in various Bureaus or at W-R (Women's Reserve) training schools or training stations, many of them in the field of selection or personnel. Although their work at the training schools and stations has been exclusively with the WAVES program, they have also been working at the Bureaus with the selection and personnel program for the men.

Two psychologists are currently assigned to the Bureau of Ships, in Washington, D. C. Lt. (jg) Helena Elizabeth O'Neill, USNR, is working in the field of selection and assignment of engineering officers; and Ensign Lillian Johnson, USNR, is assistant personnel officer of the Radio Division, handling problems of officer and civilian personnel, and administrative duties. Before joining the WAVES, Lt. (jg) O'Neill was research specialist at the Catholic University School of Nursing Education; Ensign Johnson was assistant professor in the Department of Psychology, West Kentucky Teachers' College.

In the Trainee Requirements Unit, Standards and Curriculum Section, Training Division, at the Bureau of Naval Personnel, in Washington, are Lt. (jg) Gwendolen Schneidler, USNR, formerly vocational counsellor at the University Testing Bureau, University of Minnesota; and Ensign Marjorie K. Bremner, USNR, formerly staff psychologist at the Bureau of Child Study, Chicago Board of Eduction. The function of the Trainee Requirements Unit is to achieve the efficient assignment of naval enlisted personnel to schools and duties in the Navy.

Lt. (jg) Helen Campbell, USNR, formerly instructor of psychology and education at Swarthmore College in Pennsylvania, is an instruction officer, W-R, at the Naval Reserve Midshipman's School, Mount Holyoke College, South Hadley, Massachusetts. In the selection office at the Naval Training School, (W-R) The

Bronx, New York, (for enlisted women), is Lt. (jg) Eva Bond, USNR; she was previously professor of psychology, Richmond Division, College of William and Mary, Richmond, Virginia. Lt. (jg) Mildred Mitchell, formerly psychologist for the State of Minnesota in the Bureau of Mental Health, is serving as a clinical psychologist at the Naval Medical Center, Bethesda, Maryland.

Ensign Helen May, USNR, who has had experience in clinical psychology and testing, was formerly assigned to the Selection Office at the Naval Training Station (W-R), Iowa State Teachers' College, Cedar Falls, Iowa, but has recently been transferred to the Naval Training School (W-R) at the Bronx, New York City. Ensign Almira Blanche Davis, formerly assistant professor of child psychology at the University of Tennessee, is assigned to the Naval Training Station (W-R) at Cedar Falls, Iowa.

The Director of the SPARS (Women's Reserve of the Coast Guard), Lt. Comdr. Dorothy Stratton, was formerly Dean of Women and professor of psychology at Purdue University. The newly formed Women's Reserve of the United States Marine Corps has assigned to the classification section of the personnel division Captain Cornelia Taylor Williams, USMC, W-R, formerly instructor and research counselor at the General College, University of Minnesota.

This brief summary is probably not complete; and it may be expected that other psychologists will be among those women who later join the services. In addition to the officers listed above, a fairly large number of women who have had personnel experience are now working in that field in the Naval Reserve.

THE INTERSOCIETY CONSTITUTIONAL CONVENTION OF PSYCHOLOGISTS

The national organizations which were invited by the Emergency Committee in Psychology to send representatives to the I.C.C. have chosen the following as delegates and alternates:

American Psychological Association, 5 delegates and 5 alternates named. *Delegates:* John E. Anderson, Leonard Carmichael, John F. Dashiell, Calvin P. Stone, Robert M. Yerkes. *Alternates:* Clark L. Hull, Steuart H. Britt, Ernest R. Hilgard, Herbert Woodrow, Willard C. Olson.

American Association for Applied Psychology, 5 delegates and 5 alternates named. *Delegates:* Paul S. Achilles, Steuart H. Britt, Alice I. Bryan, Edgar A. Doll, C. M. Louttit. *Alternates:* Sidney L. Pressey, Arthur W. Kornhauser, Carl R. Rogers, Robert A. Brotemarkle, William C. Trow.

Society for the Psychological Study of Social Issues, 3 delegates and 3 alternates named. *Delegates:* Gordon W. Allport, Gardner Murphy, Theodore Newcomb. *Alternates:* Ernest R. Hilgard, Otto Klineberg, Goodwin Watson.

Society of Experimental Psychologists, 2 delegates and 3 alternates named. *Delegates:* Edwin G. Boring, Robert S. Woodworth. *Alternates:* Walter S. Hunter, Samuel W. Fernberger, Donald G. Marquis.

Psychometric Society, 5 delegates and 2 alternates named. *Delegates:* J. W. Dunlap, Harold A. Edgerton, Paul A. Horst, Irving Lorge, M. W. Richardson. *Alternates:* P. J. Rulon, Ben D. Wood.

National Institute of Psychology, 1 delegate and 2 alternates named. *Delegate:* Ernest R. Hilgard. *Alternates:* G. R. Wendt, A. T. Poffenberger.

National Council of Women Psychologists, 2 delegates and 2 alternates named. *Delegates:* Florence L. Goodenough, Gladys C. Schwesinger. *Alternates:* Theodora M. Abel, Marion A. Bills.

Department of Psychology of the American Teachers Association, 1 delegate named. *Delegate:* Herman G. Canady.

Section I, American Association for the Advancement of Science, 2 delegates named. *Delegates:* H. E. Garrett, Edna Heidbreder.

The Convention will be held in New York City May 29–31, 1943. Preliminary arrangements have been entrusted by the Emergency Committee in Psychology to its Subcommittee on Survey and Planning.

PSYCHOLOGY AND THE WAR: NOTES

Army Specialized Training Program. In memorandum No. W 150-1-43 of the Adjutant General's Office of January 27, 1943, on the subject "Call to Active Duty of Students Enlisted in the Enlisted Reserve Corps, Unassigned Group," the following fields of training are listed as accepted under the Army Specialized Training Program as "approved technical engineering courses":

1. Aeronautical engineers
2. Automotive engineers
3. Chemical engineers
4. Civil engineers
5. Electrical engineers
6. Heating, ventilating, refrigerating, and air-conditioning engineers
7. Mechanical engineers
8. Radio engineers
9. Chemists
10. Mathematicians
11. Meteorologists
12. Physicists, including astronomers
13. Psychologists

Revision of Selective Service Occupational Bulletin Nos. 10 and 11. In the original Selective Service Bulletin No. 10 issued June 18, 1942, psychology was listed as one of the "critical occupations" (see *Psychological Bulletin* 1942, **39**, 522–528). Psychology was continued in the list in the revision of Occupational Bulletin No. 10 issued on December 14, 1942 (see *Psychological Bulletin*, 1943, **40**, 219–221). On March 1, 1943, however, the list of critical occupations in Occupational Bulletin No. 10 was amended by adding the field of petroleum engineering and dropping the fields of industrial engineering and psychology. In Occupational Bulletin No. 11, amended March 1, 1943, a policy of deferment is outlined with reference to students in the scientific and specialized fields listed in Occupational Bulletin No. 10.

BOOK REVIEWS

TOLMAN, EDWARD C. Drives toward war. D. Appleton-Century, 1942. Pp. xv+118.

In a charmingly apologetic and disarming Foreword Professor Tolman tells us that though others may value and exalt war he finds it horrible and cruel. As a preliminary then to preventing its recurrence he seeks to analyze the nature of war and to discover its psychological reasons and causes. His procedure, he admits, is over simple and bizarre, and only justified by a neurotic disgust with war. To use his own words: "Knowing but little sociology, economics, history, or political science, I, as a mere psychologist, will adapt concepts derived from the behavior of rats and chimpanzees, combine them with certain Freudian notions, and then attempt to apply the result to the most central and the most grievous problems of human society" (xii).

The "psychological" causes of war he finds in the frustration of those convenient little "biological" drives which make trouble when interfered with and allow peace and harmony when they have full sway. Most important are these drives, for they provide the ultimate and basic needs. "Man's houses and heating systems, his clothes, airplanes, governments, crimes, religions, and bombs are, we must assume, to be ultimately explained as but complicated outgrowths of those same biological drives and social techniques" (53). Social techniques are also drives (self-abasement, self-assertion, collective drives) which are ancillary to the basic biological drives. The drives originally are determined by heredity, but organisms learn to direct them, or they become modified and converted by repression, fixation, projection, etc.

Now the big plan to abolish war and other most central and most grievous problems is so frustrate the frustration of the drives. It is to bring about the "psychologically adjusted man." Three "practical" devices are proposed. (1) Evolve an economic order to abolish biological frustrations. (2) Invent an educational and social system to make easy the identification of children with parents. (3) Create a supranational state.

Although the Foreword forefends criticism, the text still stimulates certain questions. Even if one is willing to accept the drive-instinct conception is there any connection between these little demons and the complex phenomena of social existence and international relations? Is it possible to substitute rat and chimpanzee behavior for politics, economics, and social history? Should even such a small book be totally dissociated from societal and intersocietal institutions? Is psychology too poor to do them reverence? On the contrary, is not the psychological essence of war comprised of such complex institutional activities as are integrated with type and variety of citizenship, professional occupation, and family up-

bringing? Indeed, in his Foreword the author hints that such institutional factors lie at the root of his own hatred of war. Again, if one takes instincts seriously why discriminate against the pugnacity drive? Is not such discrimination evidence that drives are arbitrarily chosen to make a case? But if one does take instincts seriously, is it not a *tour de force* to attempt to interfere with drives or to bewail their results? And finally, in a world of drives what difference does war or peace make?

Indiana University. J. R. KANTOR.

BORNSTEIN, J. & MILTON, P. Action against the enemy's mind. Indianapolis: Bobbs Merrill, 1942. Pp. xxi+294.

The title of this book suggests a program of psychological warfare directed against the Axis Powers whereas only the last twenty pages touch lightly upon such a theme. Book One, written by Bornstein, describes German psychological warfare, its organization, principles, and methods, as it functioned in Europe and as it is applied in America. Close parallels are drawn between factional groups in all countries which provide a fertile soil for the germination of ideas likely to foster defeatism and an Axis victory. Especially selected for discussion are the problems of isolationism, Communism, anti-Semitism, and the fifth column. Only the consideration of German Americanism has a local setting. Book Two, written by Milton, consists of eleven short chapters which attempt primarily to portray conditions in America favoring the success of Axis propaganda. Again there is emphasis upon isolationism, the fear of Communism, and anti-Semitism but problems issuing out of conflicts between labor and capital, native and foreign born citizens, white and Negro populations, and among members of the United Nations are discussed along with possible solutions.

Few readers will fail to appreciate the service intended by the authors, that of presenting psychological warfare as a method of utilizing conflicting ambitions, hatreds, and ideas for the defeat of those who hold them. The plan of the book is sound in so far as it relates propaganda to dynamic ideologies. We may question, however, whether such an ambitious undertaking can succeed within the space of a brief volume. Excellent though the first part of the book is, brevity denies adequate treatment of German psychological warfare. When problems of the magnitude of those referred to in the second part of the book are presented as a succession of generalizations, no matter whether or not the generalizations are true, the reader will not be enlightened but confirmed in his existing allegiances and beliefs.

University of Minnesota. CHARLES BIRD.

NOTES AND NEWS

EDWIN B. TWITMYER, professor of psychology, chairman of the department of psychology and director of the psychological laboratory and clinic at the University of Pennsylvania, died on March 3, after a very brief illness. Professor Twitmyer was in his 69th year at the time of his death.

MARIA J. A. VAN DER LUGT has been appointed assistant professor of psychology, University of Vermont, to succeed R. M. COLLIER, who is a first lieutenant in the Army.

FREDERICK PISTOR has been appointed professor of education and psychology, Georgia State Woman's College, Valdosta.

F. G. MACOMBER, professor of education, University of Oregon, has been transferred to the WAAC training camp, Daytona Beach (Fla.) where part of his work deals with the psychological testing, classification, and assignment of incoming WAACs.

LOREN E. MESSENGER, assistant professor of psychology, Southern Oregon College of Education (Ashland), has been commissioned a lieutenant (s.g.) in the Navy.

MAJOR KARL T. WAUGH, formerly personnel officer of the department of public administration, Pennsylvania, is administering the Student War Loans Fund of the War Manpower Commission, under the direction of the U. S. Office of Education.

A. S. CLAYTON has been appointed professor of philosophy and psychology, Talladega (Ala.) College.

THOMAS W. HARRELL, on leave from the department of psychology of the University of Illinois, on duty at the headquarters of the Army Air Forces, has been promoted to the rank of major. His assignment is in the Personnel Research Section, Office of the Director of Personnel.

HENRY C. PEIFFER, instructor in psychology, San Diego (Calif.) State College, has been appointed registrar of the college.

RICHARD S. UHRBROCK, head of the research department in the Industrial Relations Division of the Procter and Gamble Company, Cincinnati, has been appointed consultant in the training within industry program of the War Manpower Commission by Chairman Paul V. McNutt. He is developing a program for the selection of new supervisors in organizations holding war contracts.

Michael Reese Hospital, announces that DR. S. J. BECK will offer his usual course this year in the Rorschach test. Accent will be on those less serious mental disturbances in which success in treatment appears possible. The differentiating patterns of the test, in these patients, will be studied from full response records, and contrasted with those found in more serious conditions. The course will be in session two two-hour periods daily for five days, June 7–11, 1943, inclusive. Interested persons are invited to communicate with the Department of Neuropsychiatry, Michael Reese Hospital, Chicago.

Midwestern Psychological Association. By a vote of 123 to 6, The Midwestern Psychological Association suspended operations for the duration in adopting the following resolution, proposed by the Council:

WHEREAS, The professional societies of the country have been asked to abolish or severely restrict travel to meetings and conventions; and

WHEREAS, Many of the members of the Midwestern Psychological Association are engaged in military or civilian government service; and

WHEREAS, The professional and scientific interests of the members of the Midwestern Psychological Association are being cared for by the American Psychological Association and other national agencies; therefore be it RESOLVED, That:

1. No further meetings or elections of the Midwestern Psychological Association be held until the restrictions on meetings are lifted;
2. Present officers whose terms of office expire in 1943 be replaced by newly elected officers who will serve until the next election;
3. Present officers whose terms of office do not expire in 1943 will continue to serve until the next election;
4. No dues be collected for the year 1942–43 or any subsequent year until meetings and elections are resumed and that those members whose dues for the year 1942–43 are already paid shall be credited with payment for the first year after the resumption of meetings and elections;
5. The officers of the Midwestern Psychological Association be authorized to conduct any necessary emergency business of the Association and to reopen the normal functions of the Association as soon as conditions permit.

New officers, elected in accordance with paragraph 2 of this resolution, are DR. S. L. PRESSEY, the Ohio State University, *President*, and DR. M. A. TINKER, the University of Minnesota, *Member of Council.*

When war time restrictions on travel are removed, a meeting will be called by the present officers, and normal functioning of the Association will be resumed.

DAEL WOLFLE,
University of Chicago,
Secretary-Treasurer.

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Psychological Bulletin

HABITUATORY RESPONSE DECREMENT IN THE INTACT ORGANISM[1]

J. DONALD HARRIS
The University of Rochester

I. Introduction

Perhaps the most ubiquitous phenomenon in animal behavior is that of response decrement as the result of repeated stimulation. For all animal forms, practically every stimulus-response relationship is subject to one or more types of decremental modification in consequence of continued stimulatory activation. It is impossible to overestimate the importance of this general fact for the definition of the precise conditions under which certain bits of behavior will or will not appear; yet with few notable exceptions —and these principally in the field of learning—psychologists concerned with the formulation of general behavior schemata have preoccupied themselves with positive aspects of reaction to the partial exclusion of the almost equally important reciprocal, or negative aspects.

The present paper emphasizes one of these negative aspects of behavior variously called "negative adaptation," "acclimatization," "extinction," "inhibition," "accommodation," "stimulatory inactivation," and "habituation," as well as other less widely used terms. Exactly what is meant by the common denominator of these generic terms cannot precisely be defined; but what is referred to are all those instances of decrement in magnitude of unlearned responses (1) which occur centrally in the intact organism, (2) which are due to repetitive stimulatory activation, and (3) which may, on the basis of criteria discussed later, be distinguished from other types of response decrement occurring as a result of, for example, receptor adaptation, loss of the effector's ability to respond, or any of the various types of inhibition.

While none of the terms cited is especially appropriate to this type of response decrement, we shall use the term "habituation" throughout. Little can be said in favor of this term except that all the others imply an

[1] Communication No. 52 from the Laboratory of Physiological Psychology, Elmer A. Culler, Director.

explanation which is unjustified by the facts, or have been used extensively in a wider variety of ways, or have some more valid use in another connection. Perhaps the most commonly applied term, negative adaptation, seems to deny that response decrement may be an active process. Habituation, on the other hand, has in its favor that it is not ordinarily applied to other types of behavior, implies the knowledge of no specific or general mechanism underlying the phenomenon (of which we are as yet in almost total ignorance), and in addition has been freely used in referring to exactly the type of behavior modification of which we speak.

This paper was undertaken upon several considerations: first, that no critical study which can be considered adequate has yet appeared reviewing habituatory response decrement over the whole range of phyla; and secondly, that the little-understood concept of habituation is being increasingly recognized as important in the analysis of learning, more particularly of conditioning (**49**, **50**, **66**, **101**, **102**).

Of the large number of references in the literature to instances of habituatory response decrement, a great many will be found as incidental notes in papers upon quite different topics. These observations-by-the-way have almost no value for a critical review, since systematic data ordinarily either have not been gathered or have not been reported so that the reader can make his own analysis. No attempt is here made to exhaust such references. There is, however, a large enough selection of papers concerned more or less specifically with habituatory phenomena so that a good number of comparisons and conclusions can be drawn; within this representation the present review claims to be rather comprehensive.

II. General Considerations

A careful analysis of the successive events in a typical response reveals quite a surprising number of significant variables. Rosenblueth (**105**), for example, lists eight events occurring in succession from the activation of a motoneuron to the final contraction of its muscle. It is probable that even in the simplest arc, containing only one or two internuncial neurons, no less than 16 or 20 separable processes occur; in the more complex stimulus-response relationships a great many more are certainly involved. Now, it is known that every one of these processes is subject to decrements of one sort or another, and further that each decrement may affect response magnitude under appropriate stimulatory conditions. But an even more bewildering set of facts appears: a number of these processes are modified in radical ways when other stimulus-

response relationships are active in the organism at about the same time, and these modifications often take the form of response decrement.

Although it is generally admitted that with any habituatory process there occur simultaneously other types of decremental processes directly affecting the same response and referable to identical activating stimuli, there is nevertheless no cause for despair. For laying out the field of habituation and for distinguishing it from closely related fields, it is fortunately true that all forms of response decrement to repeated stimulation are functions of *time*. It is primarily due to this fact that in order to discriminate types of decrement one may in most experimental situations appeal to certain qualitative and quantitative characteristics of a *series* of stimuli to which the appearance and disappearance of a particular response may be referred. For example, it is primarily by the temporal characteristics of the series of stimuli used that one may distinguish decrement of response due to receptor changes from decrement due to refractory characteristics of nerve.

One may thus with quick strokes separate types of response decrement according as they appear at particular frequencies of stimulation. When this is done it is found that certain stimulus-response integrations, activated at intervals long enough to preclude loss of ability of either receptor, conductor, or effector to respond maximally, will still decrement to zero level. To such decrement, uncomplicated by interaction with other integrations, we apply the term habituation.

In other cases, it is true, the term is applied with considerably less confidence. Granting, let us say, that habituation and fatigue in a broad sense exist as justifiably separated categories, one is often at a loss to distinguish the effects of the two processes upon a particular response. A close inspection of the term fatigue reveals, indeed, a state hardly less confused than that of habituation. Yet there is no doubt that, where the two can be distinguished, it is incumbent on the experimenter to tease out the separate effects; and further, it is certain that until this has been done no psychologizing can be attempted, *i.e.*, the constants of the mathematical relation between stimuli and response cannot be derived.

Fortunately, also, habituation may be studied as a function of variables other than the temporal characteristics of the series of stimuli in question: it is found to vary with strength of stimulus, with sense modality, with response, and with species. These and other variables hereafter described are of considerable value both in distinguishing instances of habituation and in furnishing hints

as to the fundamental conditions underlying the behavior in question.

It will be obvious, when once we have reviewed the facts of habituation from *Protista* to man, that no "mechanism" of habituation will be found. There are quite probably several mechanisms; we know, at least, that habituatory phenomena can be observed throughout so extreme a range of organisms and under such widely varied experimental conditions that any single explanatory principle would have to be too general to be satisfactory. Such an explanation as a typical neurological one, that habituation is due to changes in the properties of synapses (**99**), probably cannot apply in those organisms possessing a synctium—and certainly not in the protozoa. Moreover, even for those animals possessing true internuncial synapses this explanation does nothing more than roughly to suggest the locus of the phenomenon. We may expect to find certain conditions in the nervous system suggested as the basis for an explanation of habituation. At the moment, however, neurophysiology offers the student of habituation very little.

Accounts of habituatory phenomena as illustrative of some all-inclusive biological dictum are more unsatisfactory, and for more fundamental reasons. Explanation in terms of re-establishment of equilibrium (**59**), for example, must be rejected as insufficient. It is true that all animals are continuously and actively readjusting to energy shifts in the environment, and that new balances of all sorts are being struck; but it is apparent that such statements can be only grossly descriptive—an appeal simply to the sapience of nature will hardly suffice the careful student.

In view of our lack of the slightest knowledge as to the neurophysiological mechanisms of habituation, the most convincing type of explanation would seem to consist in stating the precise conditions over wide ranges of organism and of stimulation under which habituation will and will not appear. An analysis and summary of these conditions may then lead to more important generalizations than we command at the moment.

III. Review of Experiments

Phylum: Protista

It is sometimes stated that response decrement to repetitive stimulation in the case of the unicellular animals can only be due to a loss of receptivity. In certain cases such a crude form of

"sensory adaptation" may account for response decrement, but in other instances it can be shown that a particular response may drop out while unquestionably the stimulus is not without further effect on the organism. In any case, the temporal sequence of stimuli and the corresponding changes in protistan behavior often bear such close similarity to the phenomenon of habituation as the latter is typically exhibited in the metazoa, that it seems best to review the material on unicellular forms, with appropriate reservations in some instances as to the nature of the phenomenon.

Class: Rhizopoda. It is a universal observation that a great number of stimuli will cause Ameba to cease protoplasmic streaming, and that, if the stimulus is continuous and not too intense, the streaming will shortly begin anew. Such general statements have been made by Buytendijk (**11**) and by Jennings (**62**) for mechanical and chemical stimuli. The latter author states, "Ameba react negatively to tap water or to water from any foreign culture, but after transference to such water they behave normally." Mast reports similar behavior in the case of light, new pseudopods being formed "after a few minutes exposure." This effect apparently may be local in character if the stimulus is applied to a restricted area. (**69**)

The best evidence on habituation in Ameba is furnished by Folger, who studied it as a function of type and intensity of stimulus, of previous amount of exposure to light, and of individual differences. In his investigation of the effects of mechanical shock on locomotion in *Ameba proteus* (**36**), Folger placed individual specimens on a glass slide provided with a cover slip. A thin tube 68 cm. long was placed vertically on the middle region of this preparation and wires of weights varying from 58—428 mg. were dropped through the tube onto the slide. These weights furnished mechanical shocks of just below threshold for the middle animals and ranged upwards. The experimenter noted the length of time elapsing between cessation and resumption of movement. An indication of direct proportionality between the shock intensity and the duration of quiescence was obtained.

In another experiment Folger (**35**) studied the effects of light increase upon the same response. *Ameba proteus* and *A. discoides* were used interchangeably. In view of the supposition that in Ameba the retaining of ability to respond to light is explainable purely in photochemical terms, Folger was interested in the conditions of light and dark under which maximum reactions would occur to an increase in intensity of illumination. He presents evidence that Ameba becomes maximally responsive to light (i.e., exhibits shortest reaction-times) after 15 to 20 seconds in the dark; but by varying the duration of the light between 5 and 120 seconds *preceding* a 10-second dark-adaptation period before the test light was flashed on, Folger showed that a certain degree of recovery could take place in the dark. We cannot follow him in his conclusion that since recovery may partially occur in the light, no reversible photochemical reaction is present. However, with his statement that recovery from shock in Ameba is a complicated process we can well agree. It is probably accurate to assume that there are at least two sets of processes involved, one a true

dark adaptation and the other or others unknown. Folger is of the opinion that one of these latter occurs with equal rapidity in light and in darkness, usually occupying an extended time—one to two minutes.

The observation (Folger, **37**) that the effects of mechanical and photic stimuli are indistinguishable is of great importance in this connection. Mast (**70**) concluded that an Ameba's resumption of movement to a strong continuous light was underlaid by a process of solation taking place after sudden illumination had gelated the protoplasm. If this is true it may throw some light on the nature of mechanical stimulation. Folger demonstrated (**35**) that not only is one unable to tell from the nature of the response what has stimulated Amebae, but also that mechanical shock and photic stimuli are related in such a manner that, after cessation of movement as the result of light increase, a certain interval must elapse before the animal will respond to mechanical shock, and vice versa. Of course there is here no indication that the two processes are identical —there is only an intimation of similarity.

Class: Infusoria

Subclass: Ciliata. Without citing extended experiments indicating the ability of *Paramecium caudatum* to differentiate types of stimulus, Jennings (**62**) states that this animal has one major reaction for all stimuli to which it is responsive at all: a simple avoidance response. So true is this that Jennings feels himself able to make the generalization that the *effective* stimulus for reaction is *any* supraliminal change of energy in the environment. A consequence of this statement is that Paramecium will after some interval of time cease reacting to an energy pattern which ceases to change—and this is, in fact, just what is reported. To continuous stimulation of any sort the paramecium, it is said, "soon becomes acclimatized." This will be true, according to Jennings, for mechanical, chemical, thermal, photic, and electrical stimulation, and for stimulation by gravity or by certain internal stresses.

One important modification of this statement must be made: habituation does not occur if the extent of the environmental change is so very intense that is is likely to become immediately lethal. Thus, paramecia dropped into almost any highly injurious chemical solution will dash about till necrosed. Again, while these organisms may be kept in water slowly heated to 36–38° C, yet if dropped of a sudden into water of 37° C, neither habituation nor acclimatization occur appreciably and the animals die.

Subclass: Tentaculifera. A non-experimental reference to habituation in Stentor is found in Davenport (**18**) who quotes a friend to the effect that in a colony these creatures were seen not to contract when struck repeatedly by Tubifex worms waving back and forth in the same aquarium. That Stentor will usually contract quite readily to similar contacts if these are spaced sufficiently far apart is commonly known by all who have observed these graceful animalcules. Jennings reports that it occurs very quickly. In describing decrement of responses after the first given to mechanical stimuli, this author believes himself to have ruled out fatigue in the sense of "exhaustion" by noting that, while habituation to mechanical stimuli appears promptly, nothing of the sort appears to repeated food stimuli (**63**). In addition, he observes that habituation occurs most

readily to *weak* stimuli, whereas, if fatigue were the explanation, the more violent contractures occasioned by the more intense stimuli should produce the greatest decrement. As a further check still (**60**), he forced *Stentor roeselii* to contract steadily for an hour by stimulating with M/150 NaCl. Jennings' logic seems rigorous enough.

In the latter study also, Jennings denies "sensory" adaptation a major role in the disappearance of protistan response. *Stentor coeruleus*, Epistylis, and Vorticella, though no longer contracting in the usual manner when touched by a glass rod, yet were responding quite definitely to it by swaying, bending, etc. It is more difficult to weigh this evidence than in the case of fatigue. Complicating factors here present include the possibility of reduced local sensitivity combined with summation of stimulus effects at more distant points on the animal, and the like. It is not possible to exclude a prototype of sensory adaptation as an important factor in this case.

In the main series of these experiments Jennings struck the infusoria with a fine glass rod or a hair, roughly equating the force of the blows. All organisms contract on the first stroke irrespective of the stimulus intensity. This contraction lasts one minute or less, whereupon the animal slowly expands. If, as soon as extension is complete, another stroke be given, and this procedure be repeated indefinitely, response decrement will proceed in the direction of (1) more and more taps being necessary for a single contraction, and (2) slower extension. The following is a typical record of *Stentor coeruleus*, where the dashes indicate a contraction and the figures the number of taps necessary for one contraction to occur: 1-1-1-1-1-1-1-2-2-1-2-1-2-1-2-3-1-1-1-1-1-2-6-10-1-2-9-13-3-14-7-3-2-3-3-9-18 (here Stentor pulled loose from the substrate and moved on.) Similar results were obtained with *Stentor roeselii* Ehr., Vorticella, Epistylis, and Carchesium, except that these species never broke loose. A typical record for *Epistylis flavicans* was as follows: 1-1-1-1-1-1-1-2-33-25-7-13-36-20-14-13-13-33-9-30-3-31-226.

As a consequence of these and similar results, Jennings concludes that under certain conditions protistan behavior exhibits a type of response decrement not referable to factors of external receptivity or exhaustion, and similar in many ways to that of higher forms. He does not feel able to say anything of what the phenomenon fundamentally exists other than that the difference is "in the physiological condition of the organism before and after the stimulus" (p. 51).

A somewhat more precise control of stimulus intensity of mechanical shock with *Vorticella nebulifera* was effected by Danisch (**17**), passing over a pulley a string with a constant weight tied to one end, the other end to support a series of lighter weights falling a certain distance onto the substratum of the subjects. He corroborated the findings of Jennings that weaker stimuli are followed by quicker habituation, and adds these figures: stroke of 500 ergs followed by habituation after 9 applications; of 1000 ergs, after 15 applications; of 1500 ergs, after 40 applications; and of 2000 ergs, not after 420 applications. It is to be understood that one must regard this attempt at quantification as extremely tentative in view of the wide individual variations reported in this as well as other situations, and in view of the many technical difficulties involved.

The failure of this response to habituate to a strong stimulus in any reasonable time will be alluded to again. It will only be pointed out here that there is no indication that the most intense stimulus used by Danisch was in any sense "harmful."

Summary of Protista. The repertoire of responses to all external stimulation of Ameba and Paramecium is extremely limited, consisting of a so-called "shock-reaction," cessation of protoplasmic streaming in the former, and reversal of ciliary beat in the latter. This shock-reaction, to all but intense stimuli, will decrement in duration and extent for both animals. It is not determined whether the nature of this decrement is based on receptive factors, exhaustion factors, or other unknown internal factors; at least one important author believes the latter. Characteristic features include a nonappearance of the phenomenon to intense stimuli and a direct proportionality within limits between degree of habituation and intensity of stimuli. In the fixed infusoria, if complete extension of the tentacles be allowed after each of a series of contractions, habituation will be evidenced by an increase in number of taps necessary to cause a single contraction, and also by slower re-expansion after successive contractions.

Phylum: Coelenterata

This phylum, a step higher than Porifera (in which habituation has never been studied systematically), exhibits in its higher species several very important biological advantages over protozoa. Thus, even in Coelenterata we have the morphological requirements for behavior which, compared with Protista, is relatively complicated.

Class: Hydrozoa. Only very slight differences exist between the characteristics of habituation as found in protozoa and in the simple hydrozoa. That it occurs readily is attested by Wolff (**122**) for colony-dwelling species. Possible transfer effects within the colony are not mentioned. It was found by Goldsmith (41) that not only tapping the animal but even a slight tap on the substratum to which the animal is attached will cause a complete contraction which in a minute or less will be followed by extension. He noted that if one waited until extension was complete before tapping again, no evidence of habituation would be forthcoming. If strokes were given at shorter intervals, contraction would remain complete for a period, until finally—even though the taps were being continued—expansion of the tentacular ring occurred. A stronger intensity of stimulation would, however, reinstate contraction temporarily.

Goldsmith's observation that no habituation occurred if complete expansion be allowed is confirmed by Wagner (**113**), who found no change in readiness of contraction or in rapidity of subsequent re-expansion after

a series of 50 stimuli. In addition, this author more carefully defined the conditions of habituation. He showed that tapping the microscope stage at half-second intervals caused *Hydra viridis* to maintain contraction for thirty seconds to one minute, after which expansion took place and the taps were ineffective unless increased sharply in intensity. This was also true for touching the tentacles with a fine glass rod at intervals of a half-second or a full second.

According to Wagner, certain Hydra are much more active than others in habituating, although somewhat similar results are obtained from all species. *Hydra viridis* appears the most satisfactory form with which to work, *Hydra grisea* and *H. fusca* particularly being sluggish and irregular in reacting.

Class: Scyphozoa. Scattered references to habituation in the larger jelly-fish are contained in Romanes' classic work (**104**). He frequently remarks that specimens with which he worked became less responsive. In especial he finds that *Aurelia aurita*, if subjected to the pressures of a stream of water, will shortly show no effects of this continuous stimulation. Unfortunately this gifted physiologist, although encountering examples at every turn, was not directly interested in the problem of response decrement *per se*, and left us little detailed information on that score.

Class: Actinozoa. In the more advanced coelenterates, the sea-anemones, significant improvements appear in behavior modifiability. Of especial importance in this connection is the fact that the length of time during which a stimulus exerts its effect is much greater than in Hydrozoa.

Jennings was among the first to become captivated by these beautiful animals, which are seen when at rest to spread their highly-colored discs near the surface of the water. If a drop of water is let fall on the water just over the disc, a contraction of most of the animal will occur. In Jennings' experiment (**61**) he let single drops fall from a height of 30 cm. He found that the initial drop was invariably reacted to; but if the animal was allowed to expand before each succeeding drop, ordinarily no contraction occurred to the second and third drop, and very rarely to a fourth drop.

This response of *Aiptasia annulata* was then studied as a function of the interval between drops. The interval in the first series had varied around an average of one minute, but Jennings observed that when this interval was held constant at three minutes, rapid habituation was nearly always the case. When the interval was increased to five minutes, considerable evidence of habituation appeared, but with marked "irregularities"; and when the drops fell at intervals longer than five minutes, evidence of habituation was uncertain. Very similar results are contained in a paper of Pieron's (**87**) on mechanical stimulation in *Actinia equina* and *Actinia rubra*.

The increased duration of contraction in a series of stimuli may be cited as another indicator of response decrement in Actinia. When Kinoshita (**64**), for example, repeatedly touched the tentacles of various sea-anemones whenever they became fully extended, he found the duration of contraction to become shorter and shorter. It will be recalled that

under similar conditions *Hydra viridis* showed no variation in duration of contracture. A distinct interspecies difference is apparent in Kinoshita's data, in that some species took much longer than others to extend after the initial stimulus, but it is significant that all specimens reached a comparable level of habituation in close to the same number of trials.

Nagel (**76**) demonstrated that both Adamsia and Metridium, when pieces of meat and of filter paper were fed alternately, continue to accept the food and refuse the paper. Exactly of what this refusal consists has been the topic of nearly a dozen papers. There is some slight evidence that something like habituation underlies the phenomenon, and the controversy will be briefly reviewed.

Nagel showed (**79**) that soaking filter paper in fish juice and placing it on the tentacles of Adamsia resulted in behavior similar to that for fish meat; but that after several repetitions the ball of paper was rejected. It was remarked that on each successive repetition Adamsia held the paper a shorter and shorter time before rejecting it at once. He also discovered that in this situation the neighboring tentacles, never offered the paper, were not affected. This "dummy feeding" experiment was immediately repeated by Parker (**82**) and confirmed in detail for Metridium.

Jennings, in his major study on the sea-anemone (**61**), followed a similar procedure with *Aiptasia annulata* and Stoichactic. Specimens were alternately fed filter paper soaked in meat juice, and crab meat. The animals accepted four pieces of paper, whereupon they refused the fifth. But responses to meat likewise ceased at that point. Jennings' conclusion that loss of hunger was the explanation was apparently tenable, since, as he showed, nonstimulated tentacles were affected: he applied food alone to the tentacles on the left side, which refused it in seven trials. The tentacles on the right side were found to act vigorously. Shortly thereafter the tentacles of the *left* side accepted proffered food four times, though sluggishly; and when finally the tentacles on the *right* side were again stimulated with food, no reaction occurred, even though the tentacles of that side had reacted only once, and that fifteen minutes previously.

Allabach (**1**) was able to eliminate hunger as a variable by repeating the alternative feeding with Metridium, except that she did not allow either paper or meat to be swallowed. It turned out that whether ingestion actually occurred was immaterial to the phenomenon of response decrement. In addition, Allabach showed that loss of response occurred in about the same number of trials whether all pieces offered were meat or filter paper. In her opinion, local exhaustion of the normal supply of mucus to the tentacles of the animal is the explanation.

Gee, working with the California shore-anemone, *Cribrina xanthogrammica* Brandt, has amplified these data considerably (**38**). He precluded muscular fatigue by showing that touching tentacles with a glass rod 12 times produced 12 vigorous contractions, and that thereafter the tentacles accepted food the normal number of times. By injecting beef broth he produced a "satiated" animal exhibiting little or no contact receptivity. His conclusion that a loss in sensitivity was due to secretion of mucus does not concern us here, but his demonstration that scraping

mucus from "satiated" tentacles does *not* make the latter more sensitive is of interest. Evidently, loss of sensitivity is not due to a covering up of the sensory cells by the mucus but is due to a physiological change within the organism—Gee suggests that some substance may act directly on the nerve net in the tentacle much in the same way as an anesthetic.

More recently Parker (**83**) has considered this phenomenon and has concluded that a transfer of decrement does take place between tentacles. He believes that an almost immediate transfer of substances from cavities of the tentacles to the sensory mechanism adequately explains the transfer of decrement with food as the stimulus. With filter paper as the stimulus, on the other hand, he conceded an habituation factor of some sort, intimating that confusion has arisen from the fact that there are patently other kinds of fatigue than muscular and sensory.

The evidence of long-continued effects of feeding filter paper to sea-anemones as provided by Fleure and Walton (**33**) should convince one that the results of Nagel, Parker, Jennings, Allabach, and Gee are not altogether understandable in terms of lowered receptivity. Fleure and Walton placed filter paper on the same tentacles of Actinia once a day. Within the next few days the tentacles would no longer accept the paper unless a week or more had elapsed. Apparently there was evidence of transfer to other tentacles. It was alleged that even more striking results were obtained with Tealia. Such behavior would represent a *tour de force* of the first water for many higher species.

Summary of Coelenterata. The range of habituatory behavior is quite wide for coelenterates. In the Hydra, behavior hardly as variable as in the fixed infusoria is found. If expansion be allowed between contractions, no variability in the direction of habituation seems present. If the tapping continue during contraction, however, expansion nonetheless occurs in about a minute.

On the other hand, a much more efficient modifiability is possible to the sea-anemone, response decrement occurring sometimes after only one or two stimuli. In addition, habituation of contraction appears even though several minutes elapse between the moment of complete expansion and of a subsequent stimulation. Also, the duration of contraction becomes shorter and shorter—a factor definitely not present in lower forms.

Although the factor of loss of receptivity is by no means clear in the sea-anemone's rejection of food, there is evidence that habituation does occur in the similar rejection of a neutral substance. Indeed it is even alleged that such habituatory effects persist and are cumulative for a matter of days.

Phylum: Echinodermata

Class: Echinoidea. Von Uexküll early reported (**111**) that, when exposed to repeated shadows, *Centrostephanus longispinus* did not exhibit the typical spine-raising reaction to a fourth stimulus. We may infer,

since this response is lost after section of the radial ring, that no simply local loss of reactivity occurs in the decrement of which we speak, but that quite a complicated response, involving specialized receptors, conductors, and effectors is prevented from functioning.

Holmes (**56**) has confirmed von Uexküll's results in all details. In addition he claims that after habituation to shadows in the normal animal, a few minutes' rest may reinstate the response. Another response, that of moving away from a partially directive light, was observed to drop out as well. Specimens of the sea-urchin, *Arbacia punctulata*, were placed in a dish near a window after having been partially dark-adapted. The animals slowly moved away from the window to the farther end of the dish. If the dish were rotated 180° the animals moved again to the opposite end; but this did not go on indefinitely—a few such reversals sufficed to make even strong sunlight ineffective. Here the factor of light-adaptation is obviously not controlled.

Evidence that something more is involved, however, was provided by Holmes when he discovered that either mechanical or chemical stimuli would restore the original "phototaxis." The author suggests that the activity level of the organism was raised by these other stimuli, such activity then being directed and controlled by the light. If this is true, the original dropping off of the response was probably not due wholly to changes in light sensitivity.

Class: *Holothurioidea*. Crozier (**14**) reports that upon repeated shading, the reaction-times of *Holothuria surinamensis* Ludwig sensibly lengthen. However, the shading was carried out every half-minute, and it is known that in this species light- and dark-adaptation occur in a matter of a few minutes.

In response to repeated tactual stimuli, holothuria will quickly habituate. Grave (**42**) first observed this for the sea-cucumber, *Cucumaria pulcherrima*. He studied the contraction of the tentacles of this species to mechanical stimulation. That this response is very readily elicited was demonstrated by Pearse (**85**). When Pearse first brought specimens of another sea-cucumber, *Thyone briareus* Lesueur, into the laboratory, he remarked that any slight shock delivered to the container would elicit a complete tentacular contraction. If left in the laboratory and manipulated occasionally, it was noted that these animals underwent a deep habituation to mechanical stimuli, so profound indeed that the tentacles themselves might finally be touched with some force and still make no response. From the time relations involved, it is not possible to ascribe this decrement to receptor dulling or to effector fatigue.

Summary of Echinodermata. The rapidity with which echinoderms adapt to light and to dark render data from shadow-reflex studies equivocal on the subject in hand. There is only slight evidence for nonsensory habituation to repeated photic stimuli.

Rapid and long-lasting habituatory effects occur in holothurians in response to mechanical stimuli. In this respect they are considerably more efficient than coelenterates.

Phylum: Platyhelminthes

Class: Turbellaria. Pearl (**84**) stimulated mechanically the anterior parts of *Planaria dorotocephala* Dugès and *P. maculata* Leidy, finding that the originally convulsive movement could be observed to decline in magnitude. Although conditions of stimulation are not thoroughly reported, it seems fair to regard this as evidence of habituation.

One of the typical behavior patterns in planaria is the coming to rest shortly after stimulation with continuous light. A suggested explanation is that light adaptation has occurred. Walter (**114**) doubts that this fully explains the phenomenon, since the time it takes for a species to come to rest seems to correlate highly with measures of fatigue. This inference is not too far-fetched for us temporarily to accept, and has especial point here when we see that Walter's measures of "fatigue" are in all probability instances of habituation rather than of primarily muscular failure. As an index of fatigue he combined two measures of decline in rate of locomotion. The correspondence for four species, between so-called fatigue and time of coming to rest in strong light, is quite high.

An interesting case of habituation to rotation was also reported by Walter in this experiment. Upon slow rotation in the horizontal plane the fore part of a planarian's body raises up without disturbing the rear motion. If this rotation is repeated at half-second intervals, the worm halts with more and more uncertainty, and in a dozen trials it responds no more. After a 30-second interval the effect is altogether gone.

An instance of habituation to photic stimuli which is clearly not sensory adaptation is provided lastly by the same author. Walter set up a field divided into two sharply-defined areas of different light intensity, and induced planaria to cross repeatedly. Number of wig-wag responses of the head at the demarcation line declined in successive 25-trial averages thus: 84–76–48–32.

Class: Trematoda. In the holostome larva *Cercaria Hamata*, Miller and Mahaffy (**73**) showed that only one or two shadows, if repeated at one- to two-second intervals, were followed by the spurt of swimming characteristic of the species. However, this habituation was extremely short-lived—a few minutes at best. In a six-minute period with no shadows, five *C. Hamata* indulged in 100 brief bouts of swimming, while in a similar period with shadows once a second, only 40 such swims occurred. These time intervals were composed of eight alternate banks of stimulation and nonstimulation, each bank of 90 seconds duration. From the first to the fourth trial no evidence of habituation was apparent; obviously a minute and a half is sufficient completely to rehabilitate the response.

The same authors investigated mechanical stimulation for the same response. When 20 specimens were touched immediately following a swim 25 times each, all but 17 of the 500 stimuli were effective. Of some individuals stimulated until "fatigued," one swam 120 times, another 79. It is true that successive reactions became weaker and weaker; nevertheless the difference in number of stimuli necessary to habituate the swimming response of this animal with shadows and with touch is obvious. The argument of the authors for a dual mechanism is not justified, however, when the difference in rate of stimulation is considered.

Summary of Platyhelminthes. The structural possibilities for habituatory phenomena in Planaria have not been systematically exploited. Habituation is present in Turbellaria to mechanical stimuli and probably to continuous light. In Trematoda it seems that whatever habituation exists is transient at best.

Phylum: Annelida

Class: Chaetopoda

Subclass: Polychaeta. Hesse (**53**) early observed that repeated shadows cast on *Bispara voluticornis* quickly lost their stimulative effect, and this was confirmed by Bohn (**6**) for the same species.

In the tube-dwelling worm, *Hydroides dianthus* V, Yerkes (**123**) found that to repeated shadows the animals retracted themselves into their tubes less and less often. When stimulated at intervals of from one to twelve seconds in banks of 10 stimuli, all specimens habituated. At longer intervals this was not found to be true.

Hargitt (**46**) agrees with Yerkes that if a sufficiently long time interval be allowed to elapse between adjacent stimuli, habituation will not occur even to the weak intensities. He differs, however, in the duration of this interval: with shadows cast by a second-pendulum on *H. dianthus*, little or no variation in response occurred. At half-second intervals a few strokes of the pendulum were sufficient to produce habituation in many worms, while at quarter-second intervals this was practically universal. He further noted that other specics, *Potamilla oculifera* and *Sabella microphthalmia*, did not give clear-cut responses, and that occasionally more than one shadow was necessary to cause a contraction. A later experiment yielded similar results (**48**).

The difference between the maximum interstimulus-interval as reported by Hargitt and by Mrs. Yerkes for the same species can perhaps be referred to the past background of the individual specimens used. This is made possible by a further experiment of Hargitt (**47**) on the same species, in which he showed that specimens from shallow water made 79 responses to light increase out of a possible 100, whereas specimens from deeper water (8–20 fathoms) made only 19. That this was due to previous environmental conditions was indicated by the demonstration that keeping specimens in dim light for many weeks reversed the behavior characteristics of shallow-water individuals.

In the same experiment Hargitt showed the influence of tactual stimulation on the withdrawal response. With comparable stimulation intervals, results similar to photic stimulation were obtained.

Subclass: Oligochaeta. A brief paper by Gee (**39**) claims that the leech, *Dina microstoma* Moore, habituated rapidly both to mechanical and to photic stimulation. The author believes that loss of receptivity together with "slight changes in the nerve centers involved" probably explain the decrement.

Summary of Annelida. In spite of quite advanced morphology as compared with lower forms, no new and more efficient types of

habituatory phenomena have been uncovered in the annelids. On the other hand, the features of quick and long-lasting habituation have been met with in all of the few responses studied. The exact effect of standard, long-continued environmental conditions has been delineated for the first time.

Phylum: Mollusca

Class: Amphineura. In two experiments on *Chiton tuberculatus*, Crozier and Arey (**15**) and Arey and Crozier (**2**) studied the habituatory effects of repetitive photic and tactual stimulation. The retraction of the tentacles to shadows quickly habituated at interstimulus-intervals of less than ten seconds—with longer intervals, habituation was not exhibited till after fifty or more trials. It was noteworthy that a nearly-habituated response was reinstated if two or more shadows "in quick succession" occurred.

Class: Pelecypoda. Even in these eyeless molluscs habituation to a very few stimuli may persist for quite a while. Nagel (**77**) found this period to be a matter of hours in the case of sudden light decrease even though only one or two reactions may have occurred. Again, the same experimenter showed (**78**) that, after a number of shadows had been presented on one day, the next day's results were definitely affected.

Parker (**95**) has confirmed Nagel's statements in the former's experiments on the clam, *Mya arenaria.* The withdrawal of *Mya's* syphon to light is an exceptionally good and clear-cut response, which decrements in extent from trial to trial on any one day; moreover, the average of a series of trials on successive days will decrement likewise.

An almost identical phenomenon is observed in the scallop, *Pecten.* Hargitt (**46**) quotes Patten to the effect that in this species habituation to shadows may proceed to zero so that even the deepest of shadows produces no effect.

Class: Gastropoda. In the lower gastropods, the nudibranchiates, the interval between shadows must be very short (three to seven seconds) for habituation to occur (Piéron, **89**). Again, Piéron showed (**92**) that *Doris pilosa* profits least of the gastropods by stimulation. Crozier and Arey (**16**) tested response decrement of the nudibranch, *Chromodoris zebra*, to shadows and to mechanical stimuli. When the tentacles were touched at 10-second intervals only slight habituation was evident in 50 trials. This effect was independent of intensity of stimuli. With shadows, even 30 seconds could be used and still quick habituation occurred (three to four trials). Another nudibranch, *Facelina goslingi*, showed much greater resistance to habituation: 12–15 shadows produced no habituatory effect; it is possible that the relatively long refractory period (thirty seconds to one minute) accounts for this resistance.

In the marine snail, *Littorina obtusata*, Piéron (**92**) has performed a careful and extensive investigation into the effects of repeated shading. Individuals were placed in strong light and subjected to 15 shadows, each of one second duration, at each of seven different interstimulus-intervals. After a rest period of 30 seconds, this series was repeated as before.

When the number of shadows necessary for the response to disappear is plotted against the interstimulus-interval (the latter ranging from three to 120 seconds) a sharply decelerated curve results. Under these conditions the most efficient spacing of shadows for habituation to occur in the littorine is about one per minute. This spacing contrasts sharply with the more efficient intervals in any of the lower forms. Another highly significant improvement in the gastropod is its ability to profit over a considerable period of time. When Piéron administered the usual 15-shadow series with one-second interstimulus-intervals, allowed a variable interval to elapse, and then repeated the series, a measure of "savings" for each interseries-interval was computed by dividing the number of reactions of the *first* series into the *difference* between the number of the first and of the second series. With a two-minute interseries-interval, the savings was 77.7 per cent. However, with a full hour between series the savings was still 70.8 per cent. Another species, *L. littorea*, was somewhat less efficient.

A very important observation of Piéron's on the similarity between savings for shadows and for mechanical stimuli needs confirmation. He found that in one *L. littorea*, even though more shocks were necessary to produce habituation, the savings for shadows and for mechanical shock were indistinguishable at the five-minute interseries-interval (75.9 and 74.3 per cent respectively). Such an observation, if confirmed, would argue strongly for a single central mechanism of habituation in the marine snail.

Contraction of the antennae to mechanical stimulation in the fresh-water snail was studied by Dawson (**20**) as a function of conditions of habitat. The widest variations in reactivity were observed, one specimen "so sensitive that it reacts to a breath upon the film," another of the same species responding only to actual tapping of the antennae. That this difference was due to factors such as amount of handling and general disturbance, was proved by keeping a "tamed" snail undisturbed for weeks, while subjecting a sensitive snail to maximum handling for that period. In this case a complete reversal of physiological condition was exhibited, the "tamed" snail now being as reactive to stimuli as the sensitive one formerly was. Dawson's observations were made on a large number of individuals of eight species of Physa.

Several responses of *Physa gyrina* Say have been shown by Thompson (**110**) to decrement upon repeated stimulation. When first handled, for example, these animals expel air from the lung and drop to the bottom of the water; but upon repeated handling this ceases almost completely. Again, upon manipulation the normal mouth movements of the snail will start up after a preliminary period of decrement. Mouth movements to food were found to be decreased if the food was quickly and repeatedly withdrawn.

In the land pulmonata, Humphrey (**57**) investigated the withdrawal of antennae in *Helix albolabris* to a jerking of the substratum. Stimulation at two-second intervals was followed by loss of this response in from a few trials to sixty-three. That this response may vary in "depth" he showed by allowing a 30-second rest period to elapse after decrement

was complete. The response was thereby reinstated; but subsequent 30-second rest periods were of less and less effect.

In another land snail, *Limnaeus*, withdrawal of the whole exposed part into its shell was found by Buytendijk (**10**) to occur whenever the animal was removed manually from the substrate. After a time it would again extend its anterior portions. It was observed by this worker that, provided the snail was not roughly manipulated, the extension took place in less and less time.

Piéron has provided us with quite an impressive variety of data on habituation in *Limnea stagnalis*. A series of papers (**88–92**) deals with this subject as a function of habitat, interstimulus-interval, and interseries-interval. As to habitat, Piéron noted that individuals from small streams overshaded by many trees habituated to shadows with greater celerity than specimens from the open sea. In the latter, habituation occurred in 7 to 11 trials, but all effects were lost in twenty-four hours. One series of 22 consecutive days showed no day-by-day habituation. Such data emphasize the care which must be taken to specify previous conditions of the subjects, and serve to warn us against accepting quantitative data from this situation as more than tentative on certain points.

In one experiment Piéron (**89**) compared the number of shadows necessary to habituate *L. stagnalis* while varying the interstimulus-interval: only one tap was necessary at 5- to 8-second intervals; seven or eight were necessary at 10-second intervals; eleven to twelve taps at 20-second; and sixteen to seventeen at 40-second intervals.

Piéron in this study used habituation as a tool with which to study the "law of forgetting." He presented 15 shadows at 10-second intervals, each shadow of quarter-second duration. He allowed variable periods of time to elapse (20 seconds to 20 hours), whereupon the series was repeated. The measure of savings was then computed as outlined above. The author was struck by the resemblance of the resulting curve to that of Ebbinghaus for forgetting, especially when the time of the snail data is read as if it were minutes instead of seconds. Piéron calculated the equation of the curve to be: $m = (K (\log t)a/t)$, where m = savings, t = interposed time interval, and K, a, and b are constants of the order of 230, .5, and .36 respectively. It was claimed that the value of these constants was very similar for "individuals of the same habitat." Plots of the obtained and of the calculated values of m show a remarkably close correspondence.

In another study Piéron (**92**) attempted to find the smallest number of shadows at one-second intervals which would, after variable periods of time, have no effect on later reactions. He reasoned that this would be a measure of "mnemonic effect." Using too few individuals for any great reliability, Piéron nevertheless succeeded in describing several curves for different periods of rest. His figures can be interpreted to mean, (1) that the more repetitions of the stimuli given, the longer an appreciable effect will last, (2) that the shorter the interstimulus-interval, the more repetitions will be necessary to produce the same effect, except (3) that increasing this interval longer than about five seconds will of itself have little effect.

From his extensive studies on habituation Piéron speaks with some weight. To explain the phenomenon in its many manifestations he rejects motor fatigue on the grounds that after habituation a variety of other movements involving the same musculature may be indulged in; he rejects sensory fatigue likewise, since, as he trenchantly puts it, "Can one truly speak of a fatigue of this order for shadows which . . . constitute rather a brief sensory respite?" He refers the decrement to "associative fatigue," allying it to the decrement in those vertebrate reflexes containing an intermediary neuron.

Class: Cephalopoda. Often rated as superior to the Arthropoda on account of its advanced sensory equipment, there is yet little evidence that the cephalopod, *Octopus vulgaris*, exhibits any more complicated behavior than other mollusks. Goldsmith (**40**) was able after a dozen repetitions to cause this species to refrain from approaching a disc of metal thrown into the water. The disappearance of this response closely paralleled that of a conditioned response, an example of which it may be.

Summary of Mollusca. The elaboration of coordinating ganglia and the advance in neural control of behavior found in all mollusks have apparently paid big dividends. Even the nudibranchs are capable of retaining the effects of habituation for hours and in some cases for days. There is considerable difference in the maximum duration of the interstimulus-interval possible. *Doris* shows little habituation with intervals over seven seconds, while the snail will habituate with much longer intervals—well over two hours. In this phylum, too, habituation is more independent of stimulus intensity. There is some evidence that habituation to photic and to mechanical stimuli follows the same course. On the basis of this and other facts, Piéron, the most extensive investigator of habituation in this phylum, believes habituatory effects to be expressions of a central change in the organism, probably in the nervous system.

Phylum: Arthropoda

Subphylum: Crustacea

Class: Cirripedia. The shadow-reflex in *Balanus*, the common barnacle, consists in general contraction and in momentary cessation of respiration. Pouchet and Jobert (**97**) discovered that barnacles attached to keels of boats, which are usually shaded, do not react to shadows as readily as those fixed on open rocks. This observation is counter to the usual one, and indeed has not been confirmed. The statement that those specimens below the surface react to shadows but not those specimens on the surface (because for an animal below the surface a shadow has especial significance), is not supported by evidence that one and the same specimen will exhibit these differential reactions in reasonably close temporal proximity.

Piéron calculated the "savings" of *Balanus balanoides* when exposed to two series of 15 shadows in 15 seconds (**92**). The savings for a two-minute interseries-interval was 73.3 per cent that for a five-minute interval, 48.5 per cent. This is seen to be much less than in the gastropod under similar stimulus-conditions.

Temperature changes will affect the length of time *Balanus improvisus* stays contracted to shadows, according to von Buddenbrock (**9**). At 5° C. this time is over two minutes long. This observation, together with the statements that the time varies with shadow intensity and with shadow duration, is impossible to evaluate correctly since purely sensory factors cannot well be distinguished.

Subphylum: Insecta

Class: Coleoptera. It is equally difficult to evaluate the decrement in duration of the death-feigning in the beetle, *Tychius picirostris* (Du Porte, **29**). It was demonstrated that both temperature and duration of stimulation affect this response. Although no refractory period exists for this response longer than a few seconds, according to Du Porte, and again Bleich (**5**), still the latter has demonstrated that day-by-day habituation does occur. If the beetle, *Silpha obscura* Linn., is stuck with a pin between the meso- and metathorax dorsally, an immobility will set in which will last from a few seconds to three minutes. The day-by-day habituation of this response bears a general resemblance to that of Limnea.

Class: Lepidoptera. The rather violent reactions to continuous sound in the larvae of *Vanessa antiopa* Linn., the mourning-cloak butterfly, were observed by Minnich (**74**) to become weaker and weaker and finally to drop out altogether. When this was repeated at five-minute intervals, only a small degree of habituation was obtained. In a few specimens stimulated to zero response with a 256 d.v. tuning fork, no response was observed immediately afterward to forks of 384 or 512 d.v.; if "fatigue" was complete to the 384 d.v. tone, no response was observed immediately afterward to forks of 384 or 512 d.v.; if "fatigue" was complete to the 384 d.v. tone, no response would be given to either the higher or the lower tone (with one exception); but if an animal was "fatigued" to the 512 d.v. fork, reactions could always be elicited with the 256 d.v. and in fifty per cent of the cases with the 384 d.v. tone. This interesting result may be allied with the phenomenon of generalization as it appears in the vertebrates, or it may simply indicate that the original stimulating power of the lower tones is greater in this species. The latter seems more probable.

Class: Diptera. Holmes remarked (**55**) that with repeated light stimulation the response of mosquita larvae decrements rapidly and decidedly. These animals come to the surface of the water in sunlight, but if a shadow passes over they swim rapidly towards the bottom. After a number of shadows few larvae are seen to dive. This is confirmed by Goldsmith (**41**).

Class: Hymenoptera. Habituation in this important class is as yet not systematically studied. In the many books by the great naturalists on ants and bees, references are found only to isolated cases where individual animals have given over attempts to perform some act or have ceased some activity for unknown reasons. Thus, Wasmann reports (**116**)

that ants will shortly forego the fighting attitude if a finger continues to move outside the nest. Again, Fielde (31) states that ants, which ordinarily avoid ultraviolet light, "become used" to it in a short time. In these and a hundred other cases from the field, the stimulus conditions and the background of the individuals are so imperfectly known that no advantage is to be gained from listing them.

Subphylum: Arachnida

Class: Araneida. One of the earliest extensive accounts of habituation is the classic experiment of the Peckhams (86) on the spider. They observed that if a tuning fork was held near the animal it would drop off its web, wait a period, and then clamber back up its line. The full account of one specimen of *Epeira labyrinthea*, the most excitable species, is enlightening:

> Not until she had fallen out of the web 22 times, at the approach of the fork, could she restrain the impulse to drop. It was apparent, however, after the seventh or eighth time, that she was less startled by the sound than at first, since the distance that she fell and the period of time that elapsed before she returned to the web grew shorter and shorter in the later experiment. At first she fell 15 or 18 inches, and remained at the end of her line for several minutes, while toward the last she fell only an inch or two, and immediately ran back to her web. After the twenty-second trial she only held up her legs as the fork approached. Finally, completely worn out and disgusted, she retreated to a neighboring branch, drew in her legs, and remained sullenly unresponsive to all further attempts (p. 392).

Summary of Arthropoda. The lack of careful studies of habituation in this phylum is much to be regretted, especially in the interesting and morphologically advanced Insecta. Few generalizations can be made. What data there are show no more efficient habituatory phenomena than in Mollusca. There is the slightest bit of evidence that habituation to stimuli qualitatively close to the original habituatory stimulus may occur.

Phylum: Chordata

Subphylum: Vertebrata. Phylogenetic advances of this highest subphylum, especially the development of a dorsally-placed spinal cord and of a proportionately huge anterior brain, lead one to expect great increases in behavior modifiability in the habituatory direction. This indeed turns out to be the case. In addition, there is enough similarity in this type of modifiability among vertebrates so that responses to types of stimuli may readily be compared without considering classes separately.

Mechanical stimulation. Humphrey (59) has made some very important observations on the musk-turtle. He clamped the animal down and led a fine thread from the right hind leg to a kymograph. When the shell was tapped with an electric hammer

at two-second intervals, habituation set in by the seventh trial. In this respect the turtle is in no better case than any invertebrate; but Humphrey showed that the turtle is capable of "dehabituation": If the shell was smartly struck with a mallet near the locus of the original tapping, a response occurred, and moreover, taps *of the electric hammer* were now effective. Upon continuing the taps the response again died out. But it was significant that further mallet strokes did not suffice to reinstate the response to the taps. The author suggests that possibly two processes are involved, namely, habituation to the mallet strokes, and a deepening *below zero* of habituation to the hammer taps. In view of the fact that even the second mallet tap was almost completely without effect, it seems probable that the second of these processes is much the more likely in this case.

A related topic is the fact discovered by Dennis and Sollenberger (**21**) that rats will tend to choose maze alleys into which they have not recently gone, and especially the demonstration that the rat in a nonreward maze situation makes fewer and fewer entrances into alleys in successive minutes. The authors state their opinion that habituation is important as a mechanism in maze learning. Plots of the successive decrements per minute reported for three mazes do not always show the negative acceleration of more typical habituation curves—in one case indeed an initial increase is the case—but it is certain that several factors were operating in the situation which tended to obscure pertinent data. Also, it is probable that the shape of the curves might be somewhat more typical of habituation had results in successive half-minute steps been taken.

Habituation of a response under control of mechanical stimulation in man may be extremely resistant to habituation. Lombard (**67**) early showed that, although the human knee-jerk was susceptible to many variations, no truly habituatory effect appears. He administered up to 29 strokes at 15-second intervals several times a day over a period of six weeks.

Two modifications of Lombard's general conclusion are necessary in the light of more recent work: Wendt (**117**) intimated that habituation might have been operating to reduce the facilitative effect of the elicitation of one knee-jerk upon that of the opposite side. Dodge (**25**) administered stimuli consisting of pairs of taps on the patella, a half-second interval between taps of any pair. Over a period of 21 months, 1032 knee-jerks were recorded. From month to month only a slight increase in latency of the second tap was indicative of a decrement—on the average, however, the amplitude of the second response was about one-third less than

that of the first. There is, then, some slight indication of habituation over extended periods in the knee-jerk.

An experiment of Bass (3) shows, moreover, that the failure of Lombard and of Dodge to secure habituation within a single day is not universally true. He gave 100 stimuli at about ten-second intervals to young men and found a gradual reduction in amplitude of response throughout the period. This decline at first glance seemed more apparent under sleep, but it was noticed that objective measures of sleep showed a decline almost identical with that of the amplitude of knee-jerks under sleep. The superficial similarity of this latter curve to typical habituation curves is thus seen to be deceptive. Taking this into consideration, the curves of habituation in the waking state and under sleep decline at comparable rates. What this may indicate is at present undisclosed.

Habituation of the abdominal reflex of young men to a brief tactual stimulus is reported by Lehner (**66**). The number of stimuli needed to produce a zero response after successive dehabituations followed a negatively accelerated course.

Labyrinthine stimulation. Prince (**98**), interested in validating nystagmus as a reliable clinical sign, rotated normal cats 20 turns in 20 seconds, every two minutes for 20 consecutive days, fifty to sixty times a day. He noticed that the duration of post-rotation nystagmus varied slightly in different animals, but that a high degree of stability was retained. This result is inexplicable in view of all later work. Griffith (**43**), for instance, rotated white rats at a speed only three-fourths as fast as Prince. Ten banks of 10 rotations each were given two to three times a day. Under these conditions, noticeably less intense than Prince's, post-rotational nystagmus disappeared for 20 rats in 12 to 19 days. Ocular movements likewise were reduced from 18 to 25 on the first rotation to only one or none in ten banks or thereabouts. It was characteristic that the responses each day began a little lower than on the preceding day, and that the average for the first two banks on any day was always higher than for the last two banks of that day. Also, two rats rotated in the morning and again in the evening showed consistent decrease on the latter occasion each day, but group-to-group comparisons were not run to discover whether this was due to habituation or was a function of the time of day.

Fisher and Babcock (**32**) demonstrated habituation of after-nystagmus in man. With subjects given only one turn to the right and one to the left every day, an analysis of their data shows that

the mean of the last half of a one-day's series is less than that of the first half.

Maxwell, Burke, and Reston (**72**) considered in the rabbit both duration of nystagmus and number of eye movements after rotation. Five animals with head fixed and five with head free were rotated 180° per second 200 times a day. The curves of decrement for the two functions are strikingly similar in all details, indicating in all probability a common mechanism. It may be that the form of these curves is the typical one for a response somewhat resistant to habituation. The authors obviate muscular fatigue and sensory adaptation by producing nystagmus with aural irrigation immediately after the response disappears to rotation. The senior author later showed that the response habituated with far fewer trials than did nystagmus *during rotation* (**71**). At a time when post-rotation nystagmus had practically disappeared, rotation nystagmus had not usually been reduced as much as 50 per cent. The author indeed doubts whether the latter would ever completely disappear under these conditions.

Griffith (**44**), studying rotation in man, stated that a day-to-day decrease as well as that within a single diurnal series was found for duration of post-rotation nystagmus, number and amplitude of nystagmic eye movements, time of apparent movement of the visual field, and post-pointing.

Dodge (**24**) corroborated Griffith as to the decrease of post-rotation nystagmus from day to day and during any day's series. He specified the form of the decrement to be negatively accelerated, at least in the latter case, and speaks of a "contral compensating factor" operating in the situation, recognizing a differential effect of repetitive stimulation on the mechanisms of pursuit and of quick recovery.

Dunlap (**27**), furthermore, established that habituation of nystagmus in the rabbit is a central phenomenon by showing that irrigation of the left ear produced habituation not only in that ear, but affected subsequent behavior to irrigation of the right ear as well. Another bit of evidence that a central process is involved comes from Fearing and Mowrer (**30**), who anesthetized pigeons, then subjected them to rotation. They regard their failure to secure habituation in this case as proof of some central nervous change of a "purely functional" sort.

Mowrer (**75**) established the principle that habituation to rotation of pigeons in *both* directions, as a result of rotation in *either*

direction alone, depends in part on the relative length of the rest periods interpolated in the original habituation series, thus: the shorter the rest periods allowed, the more effective would rotation to the *right* be on nystagmus to subsequent rotation to the *left;* and vice versa.

Somewhat different results were obtained by Mowrer when the environment (a cylinder of black-and-grey stripes) was rotated instead of the bird. After-nystagmus to this type of stimulus does occur, but tends also to habituate. When the environment was rotated in the counter-clock wise direction, no habituation was apparent in subsequent tests of *clockwise* direction.

The partial dependence on the cerebellum of the habituation of this response in the pigeon was demonstrated by Halstead (**45**). Four months to a year after twenty to eighty per cent of the cerebellum had been removed, no difference between normals and operates was apparent with regard to the onset of habituation; but on testing at two or four weeks for retention, the operates had lost approximately half of the effect; normals, none.

The habituation of nystagmic head movements in the guinea pig has been studied by Smith (**108**) as a function of neural integration. An environment of black-and-white stripes was rotated slowly until nystagmus disappeared. A normal animal would habituate to such rotation in 2.6 minutes. With operated animals, however, the picture is much different. Under *right* lateral hemidecortication, habituation to clockwise (CW) rotation occurred in four minutes; but to CCW, not in half an hour. The converse was equally true under *left* hemidecortication. Apparently the operated animals were incapable of habituating to an environment rotating from the operated to the normal side.

Auditory stimulation. The supposition that those responses with relatively long refractory periods are first to habituate was made by Dodge and Louttit (**26**), from data on the guinea pig. In this animal they studied the progressive decrement of response to the same repeated stimulus—a loud click. Unfortunately for the present paper, the data obtained in this exploratory study are far from completely reported. Cohen (**12**) has amplified the data somewhat. He showed that the body startle of the guinea pig will decrement from day to day, the extent of loss depending in a peculiar way on the conditions of stimulation. Animals were given ten pairs of clicks a day for twenty consecutive days, but in four groups the interval between members of a pair was 1, 2, 3, or 4 seconds. Thirty-second rest periods elapsed between all pairs.

The initial reactions to the *second* of the pairs never averaged over a quarter-millimeter in amplitude and may be disregarded. The results show, however, that although bunching the stimuli of a pair closer together does raise the level of the response to the *first* of that pair, yet the decrement rate of this first response is similar for all groups.

Clarification of habituation in the body startle of the rat has been afforded us by Prosser and Hunter (**99**) in their study of the relation between habituation and interstimulus-interval; and they have clarified the characteristics of habituation as delineated by spontaneous recovery and by dehabituation. These authors were able to record bursts of discharge of potential from the gastrocnemius muscle of the rat in response to a click. Clicks at intervals of two to five seconds caused much quicker habituation in terms of muscle units firing, than did clicks at ten- to fifteen-second intervals. Latencies and magnitudes of individual units were apparently unchanged. "The effect is as if the threshold for different units became higher, each dropping out at some level without undergoing any change in its time relations" (p. 610).

An attempt was made to study the degree or depth of this habituation by the techniques of spontaneous recovery and dehabituation. Thus, if a response were habituated, a brief rest (15 to 20 minutes) would reinstate it. If, however, habituation were induced again, a longer time had to transpire before the response would become normal; and furthermore, the more stimuli, the longer the habituation lasted. Similar inferences on depth of habituation may be made from dehabituation data. The authors habituated the response of a reactor, and then introduced dehabituatory stimuli in the form of opening the box containing the animal, or of flashing a light. Response to the click was thereby re-established; and again paralleling the previous results, the deeper the habituation, the stronger the dehabituatory stimuli had to be to reinstate the original response.

Lehner (**66**) has found that the number of stimuli necessary to habituate the respiratory startle of the normal rat decreases with succeeding habituations in a day's trials. The curve of this decrement takes the form $N=C(E-E_0)^{-n}$, where N = number of stimulations, E = the ordinal number of the habituation in the series of habituations, E_0 places the curve on the abscissa, and C and n are constants of the order of 30 and 1.1 respectively.

Landis and Hunt (**65**) have found this picture of habituation to be essentially true for the startle reflex in man. All components of the startle except the lid reflex and slight head movements drop out, though with great variability among individuals. Apparently, however, habituation of the eyelid reflex never completely

occurs to a service-calibre revolver fired over a period of years.

Habituation in the rat of long-latency bodily activity in response to two seconds of a complex auditory stimulus was studied by Harris (**50**). A series of ten stimulations was scattered over a daily three-minute period for ten days. Both serial and diurnal results show the pronounced negative acceleration similar to that commonly reported.

Oldfield showed (**81**) that in the normal human, rapidity of habituation of the eyelid reflex to sound depended upon the intensity of the stimulus, the rapidity varying from an irregular oscillation with a painfully loud click to complete habituation in one or two trials with a click just above threshold. Oldfield remarks that dehabituation was accomplished most readily in a response habituated by the more intense stimuli.

Data on habituation of the GSR in 187 adults, as a function of interstimulus-interval and as a function of generalization, has been provided by Coombs (**13**). A variety of loud sounds and a "pure" tone were used. For all stimuli initial habituation was rapid, then slowed to a low level. As to generalization, the author concludes that habituation is in part general and in part specific. It is to be noted that this conclusion can apply only to the modality studied.

Davis (**19**) has similarly investigated this phenomenon, using a 1000 d.v. tone. Usual decrements from trial to trial and from day to day were found. It was emphasized that habituation did not proceed on control experiments with *no* sound.

Some slight indication that habituation transfer is possible from one modality to another is given by Porter (**96**). Light or bell was given first in random order for six to seven days. A tendency, not statistically reliable, existed for the second of the pair to take fewer trials to habituate completely.

Electric shock. Harris reports (**51**) that habituation in the black rat appears when amplitude of response to 1 ma. of shock is plotted against successive days' trials. Ten trials were given per day; but although a typically negatively accelerated curve appeared, response to shock was still marked by the end of the tenth day.

The Sewards have studied in the adult human female the effect of repetition on reactions to electric shock (**106**): records were secured of GSR, respiration, thickening of the thigh muscles, and of general bodily movement. Relatively weak momentary shock was applied to the foot five times a day at one-minute intervals.

All responses decremented fifty to sixty-nine per cent of the original magnitude.

Miscellaneous stimulation. The habituation of responses to fear-producing stimuli—sudden dropping back of the subject's chair—was studied by Blatz (**4**) for cardiac acceleration, respiration, and GSR. Subjects were strapped into a chair for 15 minutes a day. On the fourth day, the chair was quite unexpectedly tilted back 60°; this was repeated on the fifth day. Some differences appeared in rate of habituation among the responses, but in some subjects, to three or more falls habituation of all responses was pronounced or complete.

Habituation of the GSR in medical students to words alone was shown by Syz (**109**) to proceed with many of the characteristics of less complicated situations. The percentages of students reacting to single words of high emotional content ranged from 16 to 84%; during a second repetition of the word list, this range dropped from the original to from 4 to 68%, the average percentage loss for all words being 16.3. One should note that those words to which most students responded in the first presentation sustained in general the greatest decrement.

Allied Phenomena. Brief mention must be made of several phenomena closely related to habituation.

In the human, for example, studies on affectivity and all the studies of "mental fatigue" since Mosso have regularly shown central decrement. In these cases, however, it is clear that the stimulating conditions are far too complex to be used as a reference point for characteristics of response. Again, the central locus of the effect which stimulation of one ear has on subsequent stimulation of the other ear—Rawdon-Smith's so-called "auditory fatigue" (**100**)—should be mentioned.

In the operated animal a number of ingenious experiments have been performed, experiments which undoubtedly have the utmost significance for the problem of habituation in intact animals. Vészi (**112**), for example, showed that in the frog "associative fatigue" demanded an internuncial neuron between receptor and effector. Sherrington (**107**) had, of course, met with a decrement in the reflexes of the spinal dog to which he applied the term "fatigue" only in the broadest sense. Prosser and Hunter (**99**) have argued the habituatory decrement in the reflexes of the spinal animal demands an internuncial synapse since a reflex provided with internuncial neurons in the spinal rat habituated, while in the cat a reflex *without* such neurons did not habituate after 800 elicitations. One of Hunter's students, however, has shown that the pupillary response arc, which contains several synapses, does not habituate (**66**).

A phenomenon analogous to habituation was disclosed by Dusser de Barenne and McCulloch (**29**). Stimulating with a unipolar electrode the exposed motor cortex of the anesthetized monkey, these authors found

that under certain conditions the second stimulus of a pair would elicit no motor response or at best a weak one. While every characteristic of *both* shocks influenced the response to the *second*, the most significant variable was depth of anesthesia. Under very deep Dial anesthesia, the interval between shocks which would be followed by lack of response to the second shock was one to three minutes. This interval in the non-narcotized monkey was only four seconds.

The experiment of Dusser de Barenne and McCulloch thus gives us what seems at first glance to be the cerebral factor for habituation. It would, however, be wise to exercise caution in the interpretation of results from intact animals in the light of this study. In the first place, the time relations producing decrement and increment are too sharply defined by these authors. Bunching the second stimulus of a pair closer than four seconds, for example, will produce "facilitation" in the monkey cortex, whereas on the contrary it is usually true that such bunching in the intact animal will tend to make habituation increasingly apparent. Since the absolute magnitude of the optimal interstimulus-interval may be expected to differ from preparation to preparation, however, this argument is not conclusive. Again, moreover, the authors' implicatin of the giant pyramidal cells of the cortex as the locus of the effect obviously cannot have bearing on habituatory results from non-cerebral species. Nevertheless, the discovery of these authors, that weak or even subliminal stimuli cause decrement, is in line with all expectations; and it is likely that the authors have put their fingers on at least one important component of habituation in higher animals.

If any were needed, the experiment of Smith (**108**) provides an illustration of the complicated nature of habituation. It will be recalled that nystagmus of guinea pigs with *left* lateral hemidecortication would habituate to CCW, but not to CW, rotation of the environment. But now when the remaining hemisphere was extirpated in a second operative stage, a complete reversal occurred such that habituation to CW stimulation shortly appeared, *but not to CCW*. It may be pertinent to remark here that when Dusser de Barenne and McCulloch extirpated all the cortical layers, a pair of stimuli which would produce decrement in the normal cortex now produced increment when applied to the white substance. In this connection will also be recalled Fearing and Mowrer's demonstration that anesthetizing the pigeon prevented the usual habituation of nystagmus.

While the temporal relations of stimuli are often quite different in typical habituation studies and in studies of the characteristics of synaptic discharge, the acknowledged importance of the latter in habituation makes necessary a statement on decrement at the synapse. Thus, in a recent study Bronk, Pumphrey, and Hervey (**8**) electrically stimulated fibres to the stellate ganglion of the cat, recording from postganglionic fibres. Certain frequencies of stimulation (above 80 per second) occasioned a "ganglionic block"; while frequencies over 200 per second produced an effect over a period of several minutes. These and many related results are highly interesting and probably important for the problem of habituation, but unhappily are not specifically informative.

In considering thus summarily such data it is possible to say only that several promising leads have been opened; an extension of any one of them would almost certainly add significantly to our understanding of the internal condition of habituation. For the present, however, it is impossible to attempt anything like a thorough-going interpretation of the internal factors of habituation in these terms.

IV. Discussion

In view of the writer's feeling that the general problem of habituation is best served at this stage by a preliminary statement of the precise conditions of its appearance and disappearance, discussion of the several questions usually put in this field will be reduced to a minimum.

The Significance of Non-reinforcement. There seems no doubt that a response which is reinforced in any of the common ways will not be markedly affected by habituation, although of course decrement may occur, as in satiation. It is also true that reinforcement of any habituated response will reinstate that response with all the characteristics of learned behavior. The significance of these statements for the furtherance of our understanding of the phenomenon of habituation is clear. The former makes it plain that habituatory phenomena may be overlaid with phenomena making for increment in response—the most complex conditions for the nonappearance of habituation are thus indicated. The exact nature of these conditions has not been elucidated, but attempts are being made in this direction (**52**).

Harmful and Harmless Stimuli. The question, argued at such length in the earlier literature, whether habituation will occur to "harmful" stimuli, rests, as has already been hinted, on a misstatement of the more important question of the range of intensity within which habituation will occur. There would be no occasion whatever to adopt the completely ambiguous older terminology even if it were true, which it is not, that all undeniably harmless stimuli may occasion habituation.

In this connection are germane the statements of Sherrington (**107**) as generalized by Humphrey (**59**), that habituation to stimuli of weak intensity occurs because the rising threshold produced by a weak stimulus rises faster than summation can overcome, whereas with the more intense stimuli the facilitating effect of summation increases more rapidly.

Habituation as an Active Process. This important question has seldom been asked directly of habituation as an independent phenomenon. The phraseology usually applied is, that habituation can proceed "below zero"; but it is fair to say that this implies something more than the disappearance of a certain process. A "below zero" level has been demonstrated for a wide variety of organisms and situations, and is very likely a fundamental characteristic of habituation.

But what is the nature of a process which can decrement below zero? Several highly suggestive conclusions have been drawn for the closely related field of conditioned extinction. Culler and his students (**7**) have shown that in the buzzer-shock situation, a dog will extinguish much sooner if shocked on the thorax for conditioned foot-withdrawal than when responses to buzzer are allowed to decrement in the normal fashion. Does habituation, then, partake of the nature of conditioning? Wendt (**121**) has demonstrated that in habituation of nystagmus not only does eye movement decrement, but the movement may actually be in the direction *opposite* from the original direction. Since the time when Dodge proposed (**24**) that habituation of vestibular nystagmus be interpreted as competition between nystagmic movements and a system of "still-fixation," Wendt has been the most plain-spoken in applying the principle of reciprocal inhibition specifically to habituation data, with his concept of competition between behavior systems for possession of the final common paths (**118, 119, 120, 121**). This concept seems to the reviewer to apply particularly well to very many different instances of habituation.

The Contribution to Habituation of the Effector Response. There exist no crucial data on this interesting question. Experiments on the relative effects of different energies expended in the habituation of a response would be welcomed.

The Role of Uniformity in the Sensory Field. Oldfield (**81**) gives us the most complete discussion on this topic, stating his opinion that the contribution of the sensory field to habituation is greatest when uniformity is greatest. He recognizes with Humphrey that modern space-time concepts permit the usage of the term unity in connection with a temporal series of stimuli as well as with simultaneous events. A certain plausibility attaches to this theory, and it is certainly more sophistocated than, for instance, Washburn's view (**115**) that habituation in the higher animals is occasioned by "lack of attention." Oldfield's "uniformity," however, like Humphrey's "re-establishment of equilibrium," is another

example of one of those partial truths which upon inspection are found to be analytically fruitless.

Habituation and Refractory Phase. The concept of refractory phase of response systems has been applied, largely on the weight of Dodge's authority, to habituatory decrement. Noting that a reaction system required a certain sensible time after its elicitation before a further stimulus would be effective, Dodge (**22, 23**) began the formulation of his laws of "relative fatigue," a series of general statements relating the disappearance of the reaction to stimulus conditions and to the state of other simultaneous reaction systems. These laws were later elaborated by Robinson (**103**) to fit conditions of work decrement. It is perhaps unfortunate that the term "refractory phase" should have been chosen for the phenonenon at the basis of these laws. As Hilgard has pointed out (**54**), the term has a much more specific meaning in nerve-muscle physiology; he proposes the term "phase of decrement" as being nomcommital. We may agree that a period of variable duration exists during which a reaction is (1) less easily elicited, or (2) more easily displaced by another reaction utilizing the same final common path; but the "laws" of relative fatigue can tell us little more than has already been said in other ways.

Is Habituation True Learning? So very large a proportion of the better workers in the field have either assumed or specifically stated the affirmative that a list would be superfluous. Instances of habituation, where behavior seems loosed from the close temporal ties of stimulation, have from the first been adduced to show a certain intelligence in animals. There seems no reason to question the similarity, at the very least, of mechanisms of conventional learning and of habituation. Hymphrey (**59**), in his admirable work, has been most articulate in systematizing the whole range of learned behavior, according to habituation the most uncomplicated level, indeed, but still regarding it as unquestionably a type of learning. The failure of some to recognize this characteristic of habituation is perhaps explained by the fact that learning in its more spectacular appearances takes the form of response increment—something new has been added. The statement of Wendt (**121**) that "positive and negative learning are not separable aspects of the problem of learning, but are always to be considered together," should emphasize the point sufficiently, while his demonstration (**118**) that habituation and true conditioning may take the identical form provides near-crucial experimental support.

V. Summary and Conclusions

Consideration has been given to some of the data from the field of habituation in the intact organism. The importance of this field has been conceded in its own right as a fundamental type of response decrement, probably not essentially different from so-called "true" learning. In addition, the point of view was advanced that in certain more complex learning situations habituatory decrement may be overlaid and obscured by other processes, and that for any accurate analysis of these complex situations a precise understanding of the nature of habituation is essential.

A review of typical habituation phenomena reveals a striking similarity throughout the phylogenetic range. Studies in the lower forms have been dwelt on to emphasize the phenomenon's independence of any particular structure. Even in the Protista are found the fundamental characteristics. With increase in morphological organization, changes in the possibilities for habituation occur in the direction of a lessened dependence upon stimulus intensity and upon number of stimuli, and a progressive freeing from a more or less restricted temporal pattern of stimulation. It is significant that in organisms so relatively simple as the Actinozoa, only a very few stimuli spaced several minutes apart may produce habituation—and that in the scarcely more complicated holothurians, habituatory effects may persist for a matter of hours. The elaboration of coordinating ganglia in the mollusks permits these animals to habituate with interstimulus-intervals well over two hours. In the Arthropoda, generalization of habituation may be present. In view of these and other developments, habituation in the vertebrate proves to be qualitatively no different from that in the lower forms.

Practically every index of habituation, when plotted as a function of time, is observed to follow a course rapid at first, then progressively slower. The universality of this observation marks it as a distinguishing characteristic of habituation.

Habituatory response decrement is envisaged as the resultant of external and internal conditions. The former have been reviewed for a variety of situations and organisms, certain similarities and generalizations having been noted. Several attempts to attack the latter were reviewed, and the conclusion forced that the whole question of the internal conditions of habituation must for the present remain open.

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THE PREPARATION OF BOOK REVIEWS

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The *Psychological Bulletin* publishes many reviews of current books in psychology and related fields. By long established policy reviewers are given freedom to review books as they wish. This freedom implies an obligation to write in good taste and the realization that a good review is more than an expression of feeling. The editorial function is limited to indicating the approximate space available and to making such minor corrections as are necessary to meet style requirements. The reviewer, therefore, takes complete responsibility for the opinions he expresses.

A review differs from an abstract in that, in addition to some survey of the book's contents, it contains an evaluation. Since the *Bulletin*, with its wide circulation, goes to every Member and Associate of the Association, the reviewer owes his colleagues an accurate and fair evaluation in a vigorous and interesting manner. A review is not the place for discursive and prolix writing. In writing a review much consideration should be given to the relative importance of the material to be included in order to make full use of the space available. A defect found in many reviews is that of over-emphasis of minor details and inaccuracies to the exclusion of the major contributions made. Where a minor inaccuracy is symptomatic of the whole treatment, it can well be included. But the line between criticism for its own sake and the criticism that looks toward the improvement of the scientific field is a difficult one to draw. Where major deficiencies exist and criticism is merited, reviewers should not hesitate to express themselves vigorously.

Many reviews begin with a general statement of the book's purpose, proceed to a more detailed discussion of the contents, with some emphasis upon its contributions and its weaknesses, and close with an evaluation of its contributions as a whole. Books written by many authors, *i.e.*, collections of articles, present a special problem. In some instances the contents are so well integrated that the book can be treated as a whole; in others, the contents of the sections must be considered separately. In general, *Bulletin* reviewers do not reproduce the table of contents of a book nor present a list of chapters, but confine themselves to a more general treatment of the book by longer sections. *Practice varies widely and should vary with the book reviewed.*

The policy of the *Bulletin* is to review revised editions if substantial changes have been made. In general, such reviews are short and confined largely to the changes made. Although the *Bulletin*, because of lack of space, does not review the many monographs which appear in regular series, an exception is sometimes made when "monograph" is used loosely to cover a publication in book form not in a regular series, or when a monograph in a related field is not readily accessible but important to psychologists.

Occasionally, by editorial arrangement, a special review which is given more space than regular reviews appears. Sometimes such a review is sent to the author of the book reviewed to give him an opportunity for reply. Only, on exceptional occasions, are replies to book reviews printed in the regular book review section published.

A study of the book reviews published from September, 1941, to June, 1942, shows reviews in the *Bulletin* to average 832 words in length, with a mean variation of 304 words, *i.e.* half the reviews fall between 528 words and 1,136 words. Reviews of books in foreign languages, those dealing with history or method or those which present substantial new findings tend to be longer, while reviews of elementary texts and revised editions tend to be shorter.

For style and makeup, the reviewer should consult earlier issues of the *Bulletin*. The *Bulletin* follows the practice of *The Manual of Style* (**2**). Since reviews are presented as running text, tables and graphs are not usually included. Technical abbreviations such as IQ, CR, EEG, etc., are used rather than the full words. Numbers are always written out when they begin a sentence, and numbers under 10 are written out, except when they occur in series, or accompany the word pages. Designations of sections, parts or chapters of a book, follow the style of the book, *i.e.*, Roman where Roman occurs in the book and Arabic when Arabic occurs. References to pages in books are entered directly in parenthesis without the abbreviation p. or the word page; thus (27), (298).

Copy should be typewritten, *double space*, 27 lines to the page, $6\frac{1}{2}$ inches to the line (65 pica spaces of 75 elite spaces) with one-inch margins right and left and at the top and bottom of the page. Typed in this style, elite type runs 332 ± 19 words per page, pica 257 ± 16 words per page, and *Bulletin* print (9 on 10) 559 ± 32 words per page.

Page equivalents of copy typed in this manner, in terms of *Bulletin* print, are found in the following table.

Words	Elite Typing	Pica Typing	*Bulletin* Print
2,000	6.0	7.2	3.6
1,800	5.4	6.5	3.2
1,600	4.8	5.8	2.9
1,400	4.2	5.0	2.5
1,200	3.6	4.3	2.1
1,000	3.0	3.6	1.8
800	2.4	2.9	1.4
600	1.8	2.2	1.1
400	1.2	1.4	.7
200	.6	.7	.3

The citation at the head of the review follows *Bulletin* practice, as described by McGeoch (1). Following is an example of the manner in which the title should be typewritten (double space) at the beginning of the review:

WOODWORTH, R. S. Experimental psychology.
New York: Henry Holt, 1938. Pp. xi+889.

Note that the name of the author is typed in capitals and that only the first word of the title of the book is capitalized (except when the title itself contains a proper noun). If there is a sub-title, it is included. For joint authorship the names of the authors are typed thus:

WARDEN, C. J., JENKINS, T. N. & WARNER, L. H.

Where there are more than three authors, the senior author's name is given followed by *et al.*; if the book is a collection of articles under an editor, the editor's name is given, followed by (Ed.) in parenthesis as WATSON, G. (Ed.). If the book is a revised edition or a numbered edition, an entry is made in parenthesis after the title, thus: (Ref.) or (2nd Ed.) or (2nd Ed. Rev.). The name of the reviewer appears in capitals at the right of the page at the end of the review, and the name of the institution with which he is connected at the left in lower case underlined, to indicate italics, as in the following example:

JOHN F. DASHIELL.

University of North Carolina.

Ordinarily book reviews are prepared at the request of the editor who sends a copy of the book to a reviewer with an indication

of the space available. When the review is received in the editorial office the copy of the book becomes the personal property of the reviewer. Occasionally, however, reviews are submitted without such a request and are accepted or rejected in accordance with editorial judgment on their timeliness and value. The *Bulletin* is particularly anxious to secure reviews from the younger members of the profession and urges psychologists who are interested in their preparation to correspond with the editor.

Although the editor examines the books that are sent to the *Bulletin* and forms some opinion whether or not they are worthy of review, nevertheless, occasionally upon reading a book, a reviewer decides that it does not deserve space in the *Bulletin*. In this case, a letter giving the reasons should be sent to the editor.

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1. McGeoch, John A. Forms of citation adopted by the Board of Editors of the American Psychological Association. *Psychol. Bull.*, 1939, **36**, 25–30.
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PSYCHOLOGY AND THE WAR

Edited by

STEUART HENDERSON BRITT

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PERSONNEL RESEARCH IN THE ARMY

V. THE ARMY SPECIALIZED TRAINING PROGRAM

BY STAFF, PERSONNEL RESEARCH SECTION, CLASSIFICATION AND REPLACEMENT BRANCH, THE ADJUTANT GENERAL'S OFFICE

During the period of defense preparation which preceded Pearl Harbor, and since the declaration of war, the Army's need for leaders and technically trained men for officers and specialists steadily increased. There was at first a civilian reservoir of qualified individuals upon which the Service could draw, but in many fields of technical work the need has always exceeded the civilian supply. As the size of our armed forces increased and the manpower shortage became more acute, the Army faced mounting problems in securing trained personnel. The Army's own training program, enormous and complete as it is, is not equipped to provide the necessary types of extensive technical training, or to offer the sort of background courses required to produce potential military engineers or personnel officers. The various plans for the recruiting of college students represented attempts to maintain the flow of highly trained men into the Service. However, with the recent lowering of the draft age to 18, the supply of men from this source has been greatly curtailed.

To meet the problems involved in this situation the Army Specialized Training Program (ASTP) was established. Its purpose is to guarantee the Army the highly trained men it needs for technicians and officers. Eligibility is based upon the ability of an individual to profit from instruction and then, in turn, to render service to the Army. Institutions whose resources are to be utilized will be selected by the Commanding General, Army Service Forces;* contracts with these institutions will be negotiated by the commanding generals of the Service Commands and the Military District of Washington. These commands are geographical divisions of the country.

There is already in existence, of course, a system of Officer Candidate Schools (OCS) from which are graduated commissioned officers. These schools are specialized in accordance with the needs of the branch of the Service to which the graduate officers will be assigned. The majority of men in these Officer Candidate Schools are chosen from the ranks on the basis of performance of

* Formerly Services of Supply.

military duties, test scores, and demonstrated capacity for leadership. It is not feasible, however, in the short time available in the OCS, to offer technical training of the advanced type often required. Nor can it be given on a large scale in other Army training installations.

The administration of the ASTP will be the responsibility of the Army Specialized Training Division, recently created by the War Department. Representatives of the American Council on Education, the United States Office of Education, and various institutions of higher learning throughout the country have collaborated in developing the program, which will be divided into a Basic and an Advanced Phase.

As now constituted, the Basic Phase covers a period of nine months, and includes work in chemistry, English, geography, history, mathematics, and physics. This phase is essentially the same for all men; some differentiation in terms of the advanced curricula does occur in the latter part of the Basic Phase. The Advanced Phase involves specialized training in chemistry, engineering (aeronautical, civil, chemical, electrical, mechanical, metallurgical, and sanitary), mathematics, medicine (including dental and veterinary), modern languages, personnel psychology, and physics. Curricula are set by the Army Specialized Training Division. The Army cannot, of course, grant college credit for work accomplished, but it is hoped and expected that the colleges concerned will elect to do so. The lengths of the various curricula depend upon the field of specialization. The training will be organized on the quarter system, the academic year being divided into four 12-week terms; at the end of each term objective examinations will be given. Men in the program will attend school continuously until they are transferred to other duties.

In planning the program, there were two distinct groups of men to consider. The first includes those men not yet in the Army but who will soon be liable to call, principally the 18- and 19-year-olds, most of whom have not been to college, and those men now in college who have been deferred because of the nature of the studies they are pursuing. The second group includes the large number of older men soon to be called who also will be eligible. This group includes those men now in the Army who are as able to profit from advanced training as those who have not yet been inducted.

In setting up the program, it was important from the Army's point of view that the best men be chosen. For the men

now in the Army, it is equally important that they be given the same opportunity to apply for training as the men not yet in the Service. It is apparent, then, that the ASTP has been set up to enroll men at all stages of specialized training. This means that carefully constructed achievement examinations must be administered to all eligible men to determine exactly where they should be entered in the Basic or Advanced Phase. At the begininng, the program is primarily concerned with selecting qualified men already in the Army. When these are exhausted, the problem will be one of enrolling men entirely from those who are being newly inducted. Selection procedures will thus become simpler as the program advances.

Men participating in the program must have had at least 12 weeks of basic military training; they will be studying as soldiers under military discipline, members of the Army stationed at a college or university. No soldier is eligible for training if he has already been selected to attend Officer Candidate School or if his unit has been alerted for overseas duty. For the Basic Phase, the following additional qualifications are necessary: a man must have had a high school education or its equivalent, must be between 18 and 21 years of age (he must not have reached his 22nd birthday), and must have made scores of 110 or better on both the Army General Classification Test* and the Army Specialized Training Test (discussed below). To be eligible for the Advanced Phase, a man must be 18 years of age or older, must have had one or more years of college, and must have made a score of 110 or better on the Army General Classification Test and 115 or better on the Army Specialized Training test.

Every soldier enrolled under the program in a college or university has the rating of Private, 7th grade, regardless of his rank before entering. Commissioned officers are excluded from applying for the program. Tuition, room, board, books, and incidental fees will be paid for or furnished by the Army. Men will receive the regular pay of Privates, 7th grade, $50 per month.

The selection of qualified men now in Army installations is handled by an Army Specialized Training Program Board (ASTP Board) composed of commissioned officers working closely with the unit personnel officer. In many instances the personnel officer is an active member of the Board.

* The Army General Classification Test, given to all men entering the Army, is a measure of learning ability. Scores of 110 and above include roughly the top 30%.

During the past few months the records of all enlisted men and non-commissioned officers have been checked to identify those eligible for Basic or Advanced ASTP training. All these men will be given the ASTP Test: an educational achievement examination prepared by the Personnel Research Section of the Classification and Replacement Branch, Adjutant General's Office. Those who meet the qualifying score fill out a Personal Data Form for the information of the ASTP Board. For the most part this information is of a factual nature regarding the soldier's personal and educational history, including such points as the number of semester hours completed at the college level in a wide range of subjects and the languages which a soldier reads well, speaks well, or of which he has only a smattering of knowledge. There are also items which request information as to whether the soldier was a farm or city dweller before induction, on his *intended* occupation prior to induction (if he is a student), on the number of grades of school completed by his father and mother, and on the number of brothers and sisters he has. These last items were included to secure data on the democratic character of the selective process.

The soldier is also given opportunity to indicate his preference of courses which he would like to pursue and institutions in which he would like to carry on his studies.

In selecting and assigning men eligible for the Army Specialized Training Program, the ASTP Board will take into consideration the soldier's Army record, his qualifications, his stated preferences, and the needs of the Service. Men who meet the qualifications for the college and university Basic Course are normally assigned without question. Because present policy provides that the participation of qualified non-commissioned officers would mean a reduction in grade and pay, these men may now request that they not be assigned to college study. Privates, Privates First Class, and Technicians may not express such preference. In general, participation in the program is comparable to any other military assignment.

Students who are now in college and who have been deferred as members of the Enlisted Reserve Corps or because they are following an approved course or both, are now liable to call. Those men following approved courses who will graduate before June 30, 1943 will be allowed to graduate, at which time they will be inducted. Those men who will not have graduated by that time

will be allowed to complete the first full semester or corresponding academic period that begins in 1943, after which time they will be inducted. (Men in this group who are members of the Enlisted Reserve Corps will continue on inactive status until that time, when they will be called to active duty.) After the completion of basic military training, those who are qualified will be detailed for further instruction under the Army Specialized Training Program.

Because of the wide variation in the backgrounds of the men to be trained, it is necessary that they be assigned to work at various levels. Thus one soldier may take only the last half of the Basic Phase; another may need only one term's work in the Advanced Phase to fit him for an Army specialty. The same flexibility also exists with regard to the time men are taken out of the ASTP. The time when, and the reason for which, a man is detailed to other duties depend upon his degree of success in the work and the current needs of the Army. A man may be dropped at any time because of failure; in this case he is returned to a unit as a private. At the end of any term in the Basic Phase, he may be sent to an Officer Candidate School, he may be assigned to the next higher ASTP course, or he may be returned to troops. If a soldier completes the Basic Phase, which most of the men assigned to it are expected to do, he may then continue in the Advanced Phase. Flexibility likewise exists as to the assignment of men from the Advanced Phase. At the end of any term a man may be sent to Officer Candidate School or may be made a technical non-commissioned officer. In a few exceptional cases a man may be detailed to further Army technical training, and in very exceptional cases he may be made available for technical work to be done outside the Army but deemed highly important to the war effort.

The training, under the ASTP, of personnel technicians is a relatively small part of the program in terms of numbers of men involved. Of the 150,000 soldiers which the Army expects to have participating each year, about 800 will be detailed to study in this field. These men will pursue their work at one of eight schools (roughly one to each Service Command) chosen not only for their facilities but for their geographic location. It is emphasized that the aim here is not to train psychologists, but personnel technicians, and the curriculum has been weighted with this in mind. Following is a proposed list of courses to be taught during the fourth and fifth terms in the Advanced Phase:

	Contact Hours per Week	
Fourth Term:		
Subject	*Recitation*	*Laboratory*
Statistics	4	5
Tests and Measurements	4	5
Occupations and Vocational Psychology	4	5
Social Psychology	2	0
	14	15
Fifth Term:		
Work, Fatigue, and Efficiency	4	0
Normal and Abnormal Personality	2	0
Personnel Methods	2	3
Perception and Learning	4	5
Tests and Measurements; Interview Methods	2	7
	14	15

Tests for all ASTP courses, including those in personnel psychology, will be developed by the Personnel Research Section, Classification and Replacement Branch, AGO. As presently planned, there will be both informational and functional tests in this field at the end of each term. For the latter type, a hypothetical problem in military personnel work will be set up, and the student will be asked to suggest satisfactory procedures for resolving it. In the construction of these tests, as well as those for other fields of study, the Personnel Research Section will rely not only on its own staff but on the assistance of those who will teach these courses and on expert consultants who will work either at Washington or in the field.

The Classification and Replacement Branch, chiefly through the Personnel Research Section, plays a considerable role in the Army Specialized Training Program. Its functions are not policy making but are concerned with the selection and personnel aspects of the program. These include: the development, validation, standardization, and publication of all tests for the selection, classification, and disposition of candidates for the Army Specialized Training Program; the development of procedures for the administration, scoring and evaluation of such tests; the development of procedures to be observed by the ASTP Boards; the development of periodic achievement examinations in each subject which, together with the recommendations of the institution, will determine whether a man enrolled in the ASTP should remain therein; the

selection, procurement, training, and disposition of control personnel who will inspect, supervise, and coordinate the testing and selection phase of the program; and the development and operation of administrative procedures for the assignment and movement of men from all procurement sources to all training centers and training units.*

* Since the preparation of this report several minor changes have been made. A major change is the establishment of a STAR Center in each Service Command which functions as a reception center for ASTP personnel, receiving the men, testing them, and allocating them to participating institutions and to proper courses and levels.

THE OFFICE OF PSYCHOLOGICAL PERSONNEL—REPORT FOR THE SECOND SIX MONTHS

BY STEUART HENDERSON BRITT

Executive Director, Office of Psychological Personnel, National Research Council

I. Reports of the Office of Psychological Personnel

A report of the activities carried on by the Office of Psychological Personnel during its first six months of operation—February 1, 1942, to July 31, 1942—has previously been published (7). The present report is a brief summary for the second six months of operation, August 1, 1942, through January 31, 1943. The OPP has continued as a "clearing-house" between individual psychologists and various agencies and organizations. In addition to the usual matters involving job requests, materials for the "Psychology and the War" section of the *Psychological Bulletin*, meetings of psychologists, assistance to individual psychologists, etc., the Executive Director has been actively concerned with certain broader aspects for psychologists. To borrow a phrase used by the Subcommittee on Survey and Planning in Psychology, this has involved *the advancement of psychology as science and profession* (3). Through contacts both in Washington and elsewhere, the attempt has been made to promote sound public relations for psychology (cf. 2, 3, 15).

Detailed accounts for one-month or two-month periods have been sent regularly to the following:

1. Emergency Committee in Psychology
2. Council of the American Psychological Association
3. Board of Governors of the American Association for Applied Psychology
4. Board of Affiliates of the American Association for Applied Psychology
5. Council of the Society for the Psychological Study of Social Issues
6. Council of Directors of the Psychometric Society
7. Officers of Section I (Psychology) of the American Association for the Advancement of Science
8. Board of Directors of the National Council of Women Psychologists
9. Officers of Department of Psychology of the American Teachers Association
10. Officers and Directors of the Psychological Corporation
11. Officers of the National Institute of Psychology
12. Subcommittee on the Listing of Personnel in Psychology
13. Chairmen of Subcommittees of the Emergency Committee in Psychology

14. Chairmen of Committees of the Division of Anthropology and Psychology of the National Research Council
15. Medical Director and Secretary of the Division of Personnel of the National Committee for Mental Hygiene

II. Continuation of the Office

At the annual meeting of the American Psychological Association, September 3, 1942, it was voted that "the Association appropriate $10,000 for the support of the Office of Psychological Personnel . . . and that an additional sum of $2,680 be appropriated to be used, if, in the judgment of the Council of Directors such additional expenditures should prove desirable" (**14**, p. 727). The American Association for Applied Psychology, at its annual meeting on September 4, 1942, voted an appropriation of $1,000 as its contribution toward the support of the Office of Psychological Personnel for 1943 (**13**, p. 16). As an indication of interest in the work of the Office, the Council of the Society for the Psychological Study of Social Issues also voted to make a contribution to the Office of Psychological Personnel of $25. The OPP has continued to be housed in the building of the National Academy of Sciences at 2101 Constitution Avenue, Washington, D. C., through the generous cooperation of the officers of the National Research Council. Space has been provided by the Division of Anthropology and Psychology of the National Research Council.

The OPP is fortunate in having representatives of the Emergency Committee in Psychology, the American Psychological Association, and the American Association for Applied Psychology as official Consultants to the Office: Dr. Robert M. Yerkes, member of the Emergency Committee in Psychology; Dr. Willard C. Olson, Secretary of the American Psychological Association; and Dr. Alice I. Bryan, Executive Secretary of the American Association for Applied Psychology. These three Consultants have given counsel and advice to the Executive Director of the Office of Psychological Personnel. In December, 1942, Miss Iris Stevenson, formerly psychologist at the Wayne County Training School, Northville, Michigan, was appointed secretary and assistant to the Executive Director of the OPP.

Existing contacts between the office of Psychological Personnel and the "Clearing House of Placement of the Eastern Psychological Association" have been strengthened. Dr. Theodora M. Abel, Chairman of the Clearing House, has referred certain requests to the OPP, which in turn has submitted the names of certain psychologists to the Clearing House.

At the September meeting of the American Psychological Association it was voted that the Committee on Displaced Foreign Psychologists "be requested to turn over its functions as rapidly as practicable to the Office of Psychological Personnel" (14, p. 723). Dr. Barbara S. Burks, as Chairman, has proposed that the Committee circularize the foreign psychologists with whom contacts have been maintained, to determine their present locations; and that, following this circularization, their records be transferred to the Office of Psychological Personnel.

III. Relationships with Various Federal Agencies

Cooperative relationships continue to be maintained with various Federal agencies. The wide variety of inquiries regarding the functions of the OPP and the numerous requests for names of psychologists available for employment on specific projects provide tangible evidence that the work of the Office is becoming more widely known. The Executive Director has endeavored to follow up every special matter that comes to his attention.

1. *Office of the Adjutant General, War Department.* The Office of Psychological Personnel has continued to notify the War Department of the qualifications of men with psychological training immediately preceding their induction into the Army. Under present procedures it is believed that practically every man with psychological training is "spotted" at his Reception Center. The services of the OPP have also been utilized by some men with psychological training in the armed services who have felt that greater use should be made of their professional skills. The OPP has also assisted the Classification and Replacement Branch of The Adjutant General's Office in locating certain specialized personnel.

2. *Psychological Division, Office of the Air Surgeon, Headquarters Army Air Forces.* Contacts have been continued with various officers in the Army Air Forces.

3. *Army Air Forces Technical Training Command.* Some of the psychological activities of the Army Air Forces Technical Training Command have been described by Faubion and Bellows (10). Liaison relations have been continued with this branch of the service.

4. *Surgeon General's Office.* A recent article by Layman (11) describes the work of the clinical psychologists assigned to general hospitals of the Army.

5. *Women's Branches of the Armed Service.* Information has been obtained regarding opportunities for psychological service within the Women's Army Auxiliary Corps (WAAC), Women Appointed for Volunteer Emergency Service (WAVES), the Women's Auxiliary of the Coast Guard (SPARS), and the women's reserve of the Marine Corps (18). Contacts have been actively promoted by the Subcommittee on the Services of Women Psychologists in the Emergency, especially by Dr. Ruth S. Tolman, Chairman of the Subcommittee. A brief statement

regarding women psychologists in the WAVES, SPARS, and Marine Corps is given by Bremner (4).

6. *Army Specialist Corps.* During the latter part of 1942 the Army Specialist Corps was discontinued, but prior to that date the Office of Psychological Personnel continued to assist various psychologists on questions relating to this branch of the armed service. A report on the Army Specialist Corps has been published by Baier (1).

7. *Navy Department.* Continuing contacts have been maintained with a great many officers in several different branches of the Navy Department. Most of this work is of a highly confidential nature and cannot be published.

A note by Louttit (12) gives some indication of the extent of the activities being carried on by psychologist officers of the United States Naval Reserve.

8. *Selective Service System.* In Selective Service Occupational Bulletin No. 10, issued June 18, 1942, psychology was one of a list of "critical occupations" (8). The profession of psychology continued to be listed in the revision of this Bulletin, published on December 14, 1942 (17).*

Detailed information has been published in the *Psychological Bulletin* regarding the occupational deferment of psychologists and psychologists in training (5).

9. *Other Federal Agencies.* Day-to-day contacts, personal visits, luncheons, conferences, etc., have been continued with representatives of various other Federal agencies. The War Manpower Commission, the United States Maritime Commission, and those offices concerned with the special training program of the colleges and universities, should be specifically mentioned.

It is significant that, of approximately 4,000 men and women psychologists in the country, well over 1,000 are now in the armed services or employed as civilians in full-time war work (16).

IV. Project Carried on at the National Roster of Scientific and Specialized Personnel

The activities previously reported (6; 7, p. 782) continue to be carried on at the National Roster of Scientific and Specialized Personnel.

V. Contacts With Other Professional Societies

As described in the report for the first six months (7, pp. 782–3), liaison relations have been continued with official representatives of several other professional groups.

VI. Requests for Psychologists

A list is given in the previous published report (7, pp. 783–6) of 57 specific requests for psychologists during the first six months of

* Psychology was not included, however, in Occupational Bulletins 10 and 11, as amended March 1, 1943. (See *Psychol. Bull.* 1940, **43**, 380.)

operation of the OPP. During the second six months, an additional 104 requests were received, as listed below. Following the usual practice of the Office, unless a request was specifically limited to men psychologists or women psychologists, the names of *both men and women* were supplied in each instance.

58. Instructor for a State university. Salary $2,200 to $2,600.
59. Six additional names for commissions in the Army Specialist Corps.
60. Assistant Professor at a State university. Salary $2,500 to $3,200.
61. Man instructor at a women's college. Salary $1,800 to $2,000.
62. Social psychologist with a knowledge of the British Empire, for a government agency.
63. Psychologist with a knowledge of the Russian language, for a Government agency.
64. Confidential request for a psychologist in the field of vision.
65. Instructor at a State university. Salary $3,200.
66. Volunteer women psychologists for Council of Intercultural Relations.
67. Men psychologists for a branch of the armed services.
68. Psychologists for test construction work in the Marine Corps. Salary range $2,000 to $5,600.
69. Clinical psychologists for two penal institutions.
70. Psychologist with a sociological background for Government agency. Salary $2,000 to $3,600.
71. Industrial psychologist for a confidential project.
72. Assistant to the chairman of a research committee. Salary $3,000.
73. Psychologists with statistical training. Salary $2,300 to $2,600.
74. Psychologists for project on attitudes toward venereal disease. Salary $4,000.
75. Instructor at a State university.
76. Psychologist familiar with problems of transportation. Salary $3,600.
77. Three clinical psychologists for a State public welfare service. Salary $150 a month.
78. Instructor at a University.
79. Instructor at a University.
80. Experimental psychologist for a Government agency. Salary $4,600.
81. Instructor at a State university.
82. Women psychologists for internship at a State training school. Salary $1,800.
83. Men and women with psychological training for work as coders. Salaries $1,620 to $2,000.
84. Psychologist for a transportation company. Salary $150 a month.
85. Woman assistant for a research group. Salary $3,000.
86. Women psychologists to assist in preparing questionnaires. Salary $2,000 to $2,300.
87. Psychologist to serve as a Junior Analyst for Government Agency. Salary $3,200.
88. Psychologists to assist in a testing program for an industrial concern.
89. Psychologists with statistical training for a Government agency. Salaries $2,600 to $3,200.

90. Psychologists with knowledge of vision and fatigue. Salaries $3,600 to $4,200.

91. Psychologists at different levels, some with language skills, for a Government agency.

92. Woman psychologist with special qualifications to set up a Government project. Salary $4,600.

93. Substitute instructor at a University.

94. Two outstanding psychologists to head divisions of a new department in a University.

95. Psychologists in experimental field available to work with special research group.

96. Men psychologists with special qualifications to aid in test construction for a Government agency.

97. (See Item No. 88). Further request as to qualifications of some women psychologists.

98. Request from a State university for the names of available psychologists with particular training.

99. Request from an industrial concern for psychologists to work on a research project.

100. Men psychologists with particular qualifications for a project with the U. S. Maritime Commission.

101. Recent graduates in psychology as Assistant Personnel Technicians. Salaries $2,000 to $2,400.

102. Experimental psychologist in the field of vision. Salary $3,800.

103. Psychologists with certain qualifications, in the Army at least four months, and over 30 years of age.

104. Clinical psychologist unusually well trained, with hospital experience. Salary $3,800.

105. Social psychologist with a knowledge of statistics. Salary $4,600.

106. Young psychologist trained in elementary statistics and test construction, for special project.

107. Names of psychologists in the Army, to gather source material for a special publication.

108. Man psychologist for a position with a Government agency. Additional names for a "contact" position with this agency.

109. Men with wide training and experience in the social sciences, for work with a Government agency. Salary $5,600.

110. Psychologist trained in the field of propaganda, who would be available for a series of university lectures.

111. Psychologists trained in the field of physiological and experimental psychology, for work with a branch of the armed services.

112. Psychologists available for consultation on the problem of emotional shock.

113. Psychologist for a position in a University, with special training in the field of physiological psychology.

114. Man trained in physiological psychology, for a University teaching position.

115. Women for employment in various positions in State institutions.

116. Woman to fill a position as psychologist in a State Training School.

117. Psychologist with experience in test construction and a knowledge of Chinese.

118. Psychologists for a Government agency, available to work on some problems of regionalism. Salary $3,200.

119. Persons available at the P-2, P-3, and P-4 level for interviewing work for a Government agency.

120. Two psychologists for employment as Unit Chiefs in a Government agency. Salary $4,600.

121. Women psychologists with statistical training for work on a special project.

122. Woman psychologist for editing of manuscripts and bibliographical work. Salary $2,500.

123. Psychologist to serve as substitute instructor at a University. Salary $2,000.

124. Women qualified to recruit, train, and supervise interviewers for a polling project.

125. Vocational psychologist available for a temporary appointment on a project for the Navy.

126. Names of enlisted men in the Navy, with psychological and statistical training.

127. Psychologists with knowledge of test construction and radio and electricity, for work with a Government agency.

128. Research work of a confidential nature, for a Government agency.

129. Names of enlisted men in the Army, with psychological and statistical training.

130. Men trained in personnel procedures available for commissions in a branch of the service.

131. (See Item No. 100). Follow-up request for additional names in connection with a project of the U. S. Maritime Commission.

132. Psychologist with engineering background, for a branch of the service.

133. Persons available for a year's internship in a State institution.

134. Persons available for a year's internship in another State institution.

135. Teacher of clinical psychology in a University. Salary $1,800 to $2,600.

136. Woman to organize a Department of Clinical Psychology in a small college. Salary, $1,800 to $2,000.

137. Teacher of clinical psychology in a University. Salary $3,305.

138. Teacher of clinical psychology in a University.

139. Woman psychologist to supervise field workers.

140. Psychologists, geographically distributed throughout the United States, to act as interviewers in a public opinion polling project.

141. Psychologists with training and experience in test construction, for work with a branch of the armed services.

142. Psychologists for work of a confidential nature, for a Government agency.

143. Psychologists trained in personnel, for work with a branch of the armed services. Salaries $2,900 to $4,100.

144. Men with industrial engineering training or experience to work with a branch of the armed services.

145. Negro psychologist for interviewing, for a Government agency.

146. Men clinical psychologists for work in a State institution.

147. Personnel analysts of various grades, to deal with placement problems in a branch of the armed services. Salaries $2,600 to $4,600.

148. Clinical psychologists and statisticians for work with a branch of the armed services.

149. Psychologist trained in personnel work, for a Government agency. Salary $3,200 to $3,800.

150. Psychologists with statistical training for work with the War Department. Salaries $2,300 to $2,600.

151. Psychologist, and also psychological examiner, for a child guidance center.

152. Woman with undergraduate training in experimental psychology and physics, for work with a branch of the armed services. Salary $1,440.

153. Psychologist for administrative post in a branch of the armed services.

154. Psychologist trained in statistics, for work with a Government agency.

155. Men psychologists to teach in a special training program.

156. Psychologist for special work with War Department. Salary $3,800.

157. Men psychologists with experimental background, to work on confidential research projects.

158. Psychologist with experience in film production, for work with a branch of the armed services.

159. Clinical psychologists (one man, one woman), for a Juvenile Court. Salaries $1,900 to $2,100.

160. Woman psychologist for teaching position in a college.

161. Clinical psychologist for staff of a School of Medicine.

For the reasons stated in the previous published report, it is extremely difficult to give a complete accounting of the total number of psychologists actually placed: "(1) not all organizations have 'followed through' by indicating who was finally appointed; (2) in very few cases have the psychologists concerned communicated with the OPP when they received offers or were newly employed; (3) in certain instances psychologists whose names have been submitted to agencies have turned down offers of employment without notifying the OPP" (7, p. 786). It is definitely known, however, that a substantial proportion of psychologists have become engaged in new activities in psychology as a result of the efforts of the Office of Psychological Personnel. First, many psychologists who have registered with the OPP have had their qualifications presented to the agencies and organizations listed above and thus have received direct offers. Second, many individuals have asked for specific suggestions and in several cases have found openings due to information supplied by the OPP.

It should be emphasized that *the placement services of the Office of Psychological Personnel are not its only function.* Important though this work is, the OPP has also been concerned with public relations for the psychological profession.

VII. "Psychology and the War" Section of the Psychological Bulletin

As Editor of the "Psychology and the War" section of the *Psychological Bulletin*, the Executive Director of the OPP has at-

tempted to keep psychologists advised of changing conditions and current trends. Letters received indicate that these materials have been of value to the profession, especially to many of the younger psychologists who are most affected by war conditions.

VIII. Meetings Sponsored by the Office of Psychological Personnel

The OPP has continued to sponsor meetings of psychologists at Science Service, 1719 "N" Street N.W., to discuss topics of current interest. The programs for August through January were as follows:

August 11: Dr. Theodore M. Newcomb, review of "Civilian Morale," Goodwin Watson, Editor (Houghton-Mifflin, 1942).

October 6: J. Stephen Stock, statistician, U. S. Department of Agriculture, "The National Sample for Public Opinion Measurement."

October 20: Dr. Eugene L. Horowitz, "Democracy for Negroes."

November 3: Two Negro leaders, Truman K. Gibson, Jr., Assistant to the Civilian Aid, Office of the Secretary of War, and Mrs. Thelma Tabb, Employee Services Officer of the Office for Emergency Management; discussion of problems of the Negro in the armed forces and in civilian life.

November 17: Dr. Robert M. Yerkes, Yale University, "The Professionalization of Psychology."

December 1: Dr. John W. Gardner, Foreign Broadcast Intelligence Service, Federal Communications Commission, "The Level of Aspiration."

December 15: Major Henry Beaumont, Adjutant General's Office, War Department, "The Special Training Program in the Army."

January 12: First Lieutenant James W. Layman, Walter Reed Hospital, "The Function of the Clinical Psychologist in the Neuropsychiatric Unit of the General Hospital."

January 26: Dr. Saul B. Sells, Principal Statistician of the Statistical Standards Office, Office of Price Administration, "The Development of Questionnaires, Forms, and Surveys in a Civilian War Agency."

IX. Speeches by the Executive Director

On November 18, 1942, the Executive Director of the OPP spoke to several hundred students at the College of the City of New York on the work of psychologists in the war effort. On November 25, he addressed students of psychology at Brooklyn College.

An excerpt from the radio broadcast on "Psychologists in the War Effort" (9) of July 11, 1942, was reproduced by the Columbia Broadcasting System in the October, 1942, edition of *Talks*, quarterly digest of addresses presented in the public interest by the Columbia network.

X. Summary of Office Activities

An over-all picture of the quantity of work handled by the Office of Psychological Personnel during the first six months of operation is given in a table published in the previous report (7, p. 792). The following table gives this type of information for the second six months:

OFFICE ACTIVITIES

August 1, 1942, to January 31, 1943

	Number
Incoming	
Letters, telegrams, registration forms, etc.	2,342
Outgoing	
Letters, telegrams, questionnaires, follow-up cards, etc.	2,537*
Incoming telephone calls directly concerned with jobs, Selective Service status, registration, and appointments	829
Office callers on official business	285
Special conferences outside the office	126

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* This figure does not include checking files, compilation, and preparation of 104 different lists containing hundreds of names, each selected for certain specified qualifications.

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RECOMMENDATIONS BY THE EMERGENCY COMMITTEE IN PSYCHOLOGY ON THE OCCUPATIONAL DEFERMENT OF PSYCHOLOGISTS

For many months the Emergency Committee in Psychology has been seriously concerned with the complex problem of the occupational deferment of psychologists. Subcommittees have studied the problem, and others related to it, and have been responsible for getting psychology included in the Army Specialized Training Program. Regulations issued by the National Headquarters of the Selective Service System to State Directors and Local Boards have, until recently, included psychology as a basis for the occupational deferment of undergraduate students and graduate assistants, but at present psychology is not so listed. Teachers of psychology and professional psychologists in non-academic service have never been so included.

The purpose of the Emergency Committee in making recommendations in his area is primarily to promote the winning of the war, rather than the advancement of psychology as such. At its meeting on March 26–27, 1943, the Emergency Committee

VOTED:

(1) That the Emergency Committee *not* recommend the blanket deferment of undergraduate students in psychology, since the largest single need for personnel technicians and junior psychologists is in the Army, since the present undergraduate students in psychology constitute the largest single source of men for Army use as personnel technicians, and since these personnel technicians can be more quickly and adequately trained under the Army Specialized Training Program than under the traditional undergraduate curriculum in psychology.

(2) That the Emergency Committee recommend that a graduate or post-graduate student in psychology should be considered for occupational classification if, in addition to pursuing his graduate studies, he is also acting as a graduate assistant in a recognized college or university. A graduate assistant should be a student who, in addition to pursuing such further studies, is engaged in one of the following: (1) in scientific research certified by a recognized federal agency as related to the war effort, or (2) in classroom or laboratory instruction in psychology for not less than 12 hours per week.

(3) That the Emergency Committee recommend the occupational classification of psychologists who are training students in any of the Army or Navy Specialized Training Programs.

QUESTIONNAIRE CONTROL IN A CIVILIAN WAR AGENCY

BY SAUL B. SELLS
Statistical Standards Office, Office of Price Administration

Price control and rationing require information for planning and for control. Planning activities include the determination of maximum prices and the development of rationing programs. Control activities include administration and enforcement of existing programs. Determinations of maximum prices must be made with due consideration of many factors, including customary business practices, price, cost and profit trends, regional variations and individual differences in prices and profit margins, increased costs and changes in supply and demand. Rationing plans must be adapted to established industry organization and distribution channels. There must be accurate data on supply and demand, government and civilian requirements and needs, transportation and storage facilities, and numerous other factors.

Administration of price control involves reporting of price and financial information, procedures for price adjustment and protest, and surveys to measure compliance, to evaluate price and profit trends, and to make necessary adjustments. Certain supplementary procedures of licensing, registration, and other reporting are sometimes employed. Administration of rationing involves regular reporting of production and distribution inventories, registration of producers, distributors and consumers, circulation and accounting of ration currency, and procedures for adjustment of inventories and allotments.

Enforcement of price control and rationing programs requires a certain amount of statistical reporting, and includes investigations and compliance surveys. Questionnaires, reporting forms, and statistical surveys are the instruments for securing the necessary data for planning and for control. The Office of Price Administration has made administrative provision for the development and control of such reporting forms in order to secure maximum efficiency in their use with a minimum burden upon industry and the public.

The Statistical Standards Office of the Office of Price Administration is responsible for giving technical advice to operating departments in report and survey planning and for reviewing and approving or disapproving all public reporting forms to be sent to ten or more respondents. The Statistical Standards Office evalu-

ates every proposed public reporting form with respect to (a) its adequacy to provide the needed information; (b) the burden upon the respondent; (c) its relationship to other reports submitted by the respondent to OPA and other Federal agencies; (d) simplicity and understandability to the respondent; (e) statistical adequacy of plans for sampling, tabulation, and analysis; and (f) administrative provision of personnel and facilities for using, filing, and maintaining the collected information.

Further control is secured under the Federal Reports Act of 1942, under which public reporting forms and plans of all Federal agencies are required to be approved by the Bureau of the Budget. Duplication of reports of Federal agencies is eliminated in the review by the Budget Bureau. The Statistical Standards Office, upon its approval of public reporting forms, clears them with the Budget Bureau.

The Statistical Standards Office has adapted many procedures of psychometrics and market research to the development of public reporting forms. Objective questions, questionnaire format, graded vocabularies (particularly in forms designed for consumers), pretests of items, forms and instructions are regularly used. Periodic re-examination is made of recurrent forms with reference to the quality of the returns, the experience and recommendations of personnel at Local Boards, field offices and in Washington, and to the experience of respondents. Preliminary discussion of questionnaires with representatives of industry and of trade associations is frequently useful in adapting forms to the language and record keeping conventions of particular groups and in securing their cooperation in filing returns.

To develop standards for improved practice, the Statistical Standards Office makes studies of completed surveys with respect to specific reporting problems. A detailed formulation of criteria for public reporting forms has been developed and is being expanded as rapidly as possible. These criteria relate to form design, methods of collecting information, statistical procedures and administrative procedures. Most OPA surveys of price problems are based upon relatively small samples. As a basis for sampling analysis, the Statistical Standards Office compiles source data, based upon Census reports, reports of other Federal agencies, and previous surveys.

The percentage of returns to mail questionnaires is unusually high, often exceeding 80 per cent. An exception may be cited, however, in the case of mail-accounting surveys. In one study of

appropriate methods for collection of information, a recommendation was made with respect to inquiries seeking unit cost information that such investigations should be made only by personal visit of trained accountants, and only after detailed uniform instructions are provided. The findings of this study indicate that sometimes as few as 10 per cent of such returns are received, as a result of restrictions of available records and complexity of accounting analysis. Surveys at wholesale and retail levels, and financial studies of accounting data, are made regularly by personal vists. The resources of the Regional Offices and of other agencies are usually employed for field studies.

The planning and review staff of the Statistical Standards Office includes fourteen analysts and a section chief. The Civil Service classification adopted for analysts is "Economic Statisticians." Of the present staff, three members are trained psychologists; two, sociologists; one, a mathematical statistician, and the remainder social or economic statisticians. The general nature of the problem and many of the specific skills called for have demonstrated the need for persons with psychometric and social-psychological training. Although the activities of public reporting, form planning, and design are currently carried on primarily by social and economic statisticians, there are increasing opportunities in this field of work for psychologists.

PSYCHOLOGICAL ASPECTS OF REHABILITATION

BY ROGER G. BARKER

Stanford University

The task of rehabilitating physically disabled persons has been greatly increased in its scope and its urgency by the war. The extent to which psychological problems are met in this work is indicated by the following listing of activities in which various classifications of rehabilitation workers engage:

Restoring motor functioning after neural lesion, muscular atrophy, and joint ankylosis.
Measuring progress of motor restoration.
Re-educating motor abilities after amputation and paralysis.
Motivating patients to accept treatment and training, and to cooperate in making it most effective.
Preventing patients from becoming emotionally dependent upon treatment, therapist, or institution.
Detecting and coping with malingering.
Administering painful treatment.
Overcoming fear of diagnostic and treatment procedures.
Administering bedside mental hygiene; individual morale.
Planning and administering occupational therapy programs.
Organizing and administering wards and institutions for optimal social adjustment of patients; group morale.
Aiding personal adjustment to permanent disabilities and to changed roles in military or civilian life.
Vocational and educational counselling.
Working with persons having special types of disabilities, e.g., the blind, the deaf, cardiac cases.
Providing vocational and academic education.
Selecting rehabilitation personnel.

From this it would appear that any expansion of the rehabilitation services of private and government agencies to the point where additional personnel are needed will require courses of instruction in the psychological aspects of rehabilitation for several classes of workers. There are likewise technical psychologists required in any expanded rehabilitation program who would benefit by special training in the particular psychological problems of the invalided and disabled.

A considerable amount of material from physiological and experimental psychology, abnormal and clinical psychology, child and educational psychology, and industrial psychology is relevant to problems of rehabilitation. However, much of it requires interpretation and application to specific rehabilitation problems before it is of much value to rehabilitation workers. At Stanford Univer-

sity a course in psychology for rehabilitation workers has recently been offered, a topical outline of which is herewith presented. Inasmuch as this particular course was arranged especially for physical therapists, occupational therapists, and nurses, the sections on motor learning, motivation and adjustment, and mental hygiene were emphasized. Psychiatric problems have been avoided.

Topical Outline of Course in Psychology for Rehabilitation Workers

I. *Physiological psychology of motor functions*
   A. Techniques and limits of restoring function in cases of peripheral and central neural lesions, and muscular lesions
II. *Psychology of motor learning*
   A. Optimal procedures for making and breaking motor habits
   B. Measurement of motor learning
III. *Motivation and adjustment in the therapeutic situation*
   A. Psychological factors in the treatment situation which aid and which impede medical therapy
      1. Effect of emotionality upon autonomic and voluntary systems
      2. Sources of emotionality in treatment situations
      3. Retraining and readjustment procedures; desirable and undesirable adjustments to treatment
   B. Motivating procedures in the treatment situation
      1. Importance of the larger personal meaning of treatment to the patients
   C. Psychological factors increasing and decreasing sensitivity to pain and discomfort
IV. *Mental hygiene of the hospitalized person*
   A. Unique aspects of the hospital situation
      1. Isolation
      2. Prepotency of internal stimuli
      3. Dependence upon decisions and motor functions of others
   B. Behavioral resultants of unique psychological situation
      1. Regressive behavior: egocentricity, dependence, limited interests
   C. Mental hygiene procedures
      1. Desirable and undesirable occupational and recreational procedures
      2. Desirable and undesirable institutional routines and organization
      3. Group activities in wards
      4. Extramural contacts
      5. Roles of staff members
         a. Problem of emotional dependence
         b. Function of the interview
         c. Techniques of interviewing
   D. Social psychology of institutional morale

V. Problems of adjustment to permanent disability and to changed role in military and civilian life
- A. Psychological situation of the disabled in our culture
- B. Advantageous and disadvantageous adjustments to disability
- C. Attitudes and behavior of family and acquaintances
- D. Psychotherapeutic indications and techniques

VI. Special problems met in the vocational and educational guidance and psychometry of disabled persons

VII. Psychology of special disabilities

Our experience with this course has pointed to the need for a bibliography of the pertinent psychological literature; and, if the demand warrants, for a manual of psychology for rehabilitation workers; for demonstration and training centers for the application of psychology to rehabilitation problems; and for fundamental research upon the adjustment problems of the physically disabled.

BOOK REVIEWS

De Silva, Harry R. Why we have automobile accidents. New York: John Wiley, 1942. Pp. xvii+394.

The problem of controlling automobile accidents in the United States is one worthy of the research efforts of our best scientists, technicians, and public leaders. Dr. De Silva has assisted in the eventual solution of the problem not only by his individual research on specific points but perhaps even more by his formulation and analysis of the problem as a whole. The magnitude of the problem is reflected in annual casualty lists which can only be compared with those of our major wars, while the losses in property damage and impaired production of both civilian and war programs is measured in millions of dollars and valuable time. In contrast with the importance of the problem to practically every citizen, our efforts in accident prevention have been piecemeal and largely ineffective. Isolated groups such as commercial fleet operators and individual cities and states have shown that it is possible to make vast improvements at costs which are well within reason, yet most other groups have continued with little or merely temporary improvement.

De Silva points out that our strong but often irrational insistence on individual rights of citizens to be drivers is an influence which often negates safety movements. We tend to suppress the unpleasant facts or to attack superficial causes. Another factor in the continuation of inadequate public response is the complexity of the problem. Even the professional reader will probably be surprised to find how difficult it is to secure reliable statistics on accidents so that the influence of various factors can be estimated in planning a safety program. Automobile transportation is so basic to personal, social and business affairs that it is not surprising to find that analysis of the rule of any single factor is extremely difficult. For example, the significance of highway curves may be confused with that of the location of roadhouses producing drunken drivers, while the creation of super highways which remove many hazards of ordinary driving may lead to such an increase in driving speeds as to increase accident rates. Dealing with single variables has usually produced only temporary improvements or face-saving evasions of the issue.

Until we have centralized reporting of automobile statistics it will be necessary to seek out localities in which significant factors have been varied in attempts to control accidents and then put together a composite estimate. However, even if we had centralized handling of statistics the problems of experimental and statistical design of studies, e.g., analysis of variance, are as fascinating as they are important. In place of current criterion measures such as the standard of "fatalities per vehicle mile" De Silva suggests as indices either fatal and personal injury accidents per vehicle mile or all fatal and non-fatal accidents per vehicle mile.

In evaluating the bases underlying individual differences in accident rates De Silva reviews the evidence for four main groups of factors: (1) exposure, in terms of distances driven under various geographical, climatic, temporal and other traffic conditions; (2) speed; (3) skill; and (4) safety mindedness, a composite of attitudes, skills and information. In the re-

lated problem of measuring the relative accident rates of cities or states the interplay of various factors such as proportions of urban and rural areas, economic, educational, geographic, climatic, and other factors are so complex that comparisons on any simple bases such as number of accidents per year for each driver would be greatly misleading. Marked shifts in the safety ranking of states occur as successive additional factors are taken into account.

In evaluating the roles of improved automobiles and highways it is apparent that desirable as they are, these alone are inadequate to solve the whole problem of automobile accidents because of the numerous human factors such as poor attitudes and skills of drivers, and the carelessness of pedestrians, who are a major factor in accidents. Furthermore, highway improvement is markedly limited as a method of accident control because of its much greater costs in comparison with vehicle, driver and pedestrian factors.

Best practices in training, examining, licensing, and later controlling drivers are reviewed. Training will probably have to become a part of our public school work, but in the meantime must be supplemented by other civic agencies for adults in addition to private agencies. Through licensing examinations there is an operational check on the end result of whatever kind of training is provided and this can be made very effective in eliminating poor drivers but follow up enforcement is necessary to continue its benefits. On account of the practice of admitting all drivers who were experienced at the time the licensing laws went into effect, about 60% of all present drivers have never taken a real driver's examination. The usefulness of driver clinics and other positive motivating devices to supplement merely negative (punishment) programs is indicated. Lack of continuity in office among state vehicle administrators may partially nullify a good license law, as will the lack of adequate training, consistent support and adequate working conditions for the examiners and patrolmen. Civil service provisions now cover only a small portion of examiners, thus inviting political abuses.

In the opinion of the reviewer Dr. De Silva has rendered a major service in giving an understandable picture of the importance of automobile accidents, their underlying factors, and the relative effectiveness of the various plans which have been developed to care for each aspect of the problem. He has also shown the importance of interrelations between factors and the necessity for a national organization for the supervision and integration of automobile accident reporting, analysis, and safety planning. Any civic leader or public official concerned with the problems of automobile accident prevention will find in this book a very helpful analysis of each of the major problems involved, together with an evaluation of the ways in which the various possible remedial measures have worked out in practice.

All too many efforts of applied psychologists have been concerned almost exclusively with the application of experimental and statistical methods to a specific practical situation. Useful and necessary as this is, it frequently fails to be as helpful as it might be if it had been preceded by more thorough analysis of all the major factors in the situation, and followed by a synthesis of all the major lines of evidence into the best avail-

able plan of action. Teachers of applied psychology may find this book a useful illustration of such a methodology as well as a summary of the latest knowlege in its special field.

ROBERT H. SEASHORE.

Northwestern University.

LEWINSON, THEA STEIN and ZUBIN, JOSEPH. Handwriting Analysis. New York: King's Crown Press, 1942. Pp. xiii + 147.

According to a statement by its proponents, graphology has recently become increasingly important as a tool of psychology. Although this art is much used in Europe, according to the statement, it is regarded in America with skepticism because of the obviously subjective character of the ratings upon which the graphologists depend. This book is an attempt to replace the subjective bases by means of a set of objective scales. These scales are offered in the hope that they will stimulate the scientific study of problems heretofore studied intuitively.

Handwriting is regarded as a highly individual form of behavior, expressive of the total personality pattern, which is to be approached through consideration of the type of movement which produces the specimen. A basic hypothesis in this approach is that these movements vary individually from very contracted or controlled movements to those very much released. In order to be legible, handwriting must be controlled, but too much control means a cramped style. Balance is regarded as the midpoint of the scale, indicative of a strong, rhythmic movement.

The approach is analytic. Each of twenty-two details is to be rated according to a carefully prepared scale, where plus three is extreme contraction, zero is rhythmic balance, and minus three is extreme release. The details considered include those grouped under four main components namely: *form*, which deals with the general appearance and shape of letters, ornamentation, etc.; the *vertical aspect*, which includes such things as the height of various parts of letters, the distance between lines, etc.; the *horizontal component*, which includes such things as space between letters and words, slant, etc.; and finally the *depth component*, which deals with pressure, cursiveness, etc. The treatment of details of handwriting is thorough, entirely reasonable, and at times tedious.

The explanation of the method of using the scale is clear-cut. It is accompanied by specific suggestions as to statistical procedures which may be useful in testing various hypotheses. Some results are given from the study of five normal and fifteen insane subjects, showing that the handwriting of the normal in some respects approximates rhythmic balance, while that of the insane exhibits significant and interesting deviations from such balance.

This book may be regarded as a manual for a set of objective scales. Judging it as one does a newly-published test and manual, one notes that the standardization is extremely tentative, the scale-making procedure is competent, and the idea behind it is a set of hypotheses which constitutes the basis for graphology. The weakest point in the whole approach appears to be the basic postulate, namely that "if a person's handwriting is characterized by balance between contraction and release, his personality too is rhythmically balanced and consequently well adjusted." In the

judgment of the reviewer, this postulate is contrary to all the tendencies of research findings concerning personality, in that research on personality fails to show any close integration which would permit diagnosis of personality type from study of any one limited aspect of behavior.

The graphological system of Klages and Pulver, presented in chapter nine of this book, appears absurd and mystical, at least insofar as its application to normal subjects is concerned. One may therefore be grateful for the construction of a set of objective scales for use in testing theories which might otherwise be defended by evasion and general vagueness. The scales herein provided are probably both reliable and objective to a degree satisfactory for the purposes in mind; their validity is yet to be established.

H. D. CARTER.

University of California.

INBAU, FRED E. Lie detection and criminal interrogation. Baltimore: Williams and Wilkins, 1942. Pp. vii+142.

This is a technical manual in an applied field. It is technical in the sense that it deals soundly and carefully with a professional subject. It is applied in that it accepts the phenomena in question (the bodily manifestations of emotions) and makes no attempt to investigate their fundamental causes and relationships, merely discussing their application in the practical situation of lie detection. The experimental psychologist will be disappointed in that it contains no analysis of the intricacies of the physiological processes which are being utilized. He will be pleased, however, to find that the book is conservatively written and deals briefly but adequately with such over-enthusiasts as Dr. Marston and the late Rev. Walter G. Summers.

The book is divided into two sections. The first deals with lie detector technique and concludes with an interesting chapter on its legal aspects. The second section discusses criminal interrogation. This is handled on a purely clinical and empirical level but is none the less interesting and stimulating. Its applications are much broader than the mere field of criminal interrogation and can be helpful to anyone working in the general field of interviewing. This reviewer has found much in it which is applicable to psychiatric interviewing in selecting naval recruits where many of the volunteers attempt to conceal disqualifying defects in order to join the Navy. This section ends with a discussion of the legal aspects of criminal interrogation.

The book is well written and has been given an adequate index and format.

WILLIAM A. HUNT.

U. S. Naval Training Station,
Newport, R. I.

NOTES AND NEWS

JAMES BURT MINER, head of the department of psychology, University of Kentucky, died, March 24, at the age of sixty-nine years. Dr. Miner had served as instructor in psychology (1903–04), University of Illinois; instructor (1904–05) and assistant professor of philosophy (1905–06), the State University of Iowa; assistant professor of psychology (1906–15), University of Minnesota; assistant professor (1915–18) and associate professor of psychology (1918–21), Carnegie Institute of Technology; professor of psychology and head of the department (since 1921) and director of the personnel bureau (since 1930), University of Kentucky.

LILLIEN JANE MARTIN, professor emeritus of psychology, Stanford University, died, March 26, at the age of ninety-one years. Dr. Martin began her teaching career at the Indianapolis High School (1880) as a teacher of science. She served as vice-principal and head of the department of science, Girls' High School, San Francisco (1889–94), and assistant professor (1899–1909), associate professor (1909–11), and professor of psychology (1911–16), Stanford University. From 1916 until a week before her death, Dr. Martin had served as psychopathologist and chief of the mental-hygiene clinic at the San Francisco Polyclinic and Mt. Zion Hospital.

CHRISTIAN H. STOELTING, president of C. H. Stoelting and Company, Chicago, and a former president of the Scientific Apparatus Makers of America, died on March 18 at the age of seventy-eight years.

The Officers and Directors of the Massachusetts Society of Clinical Psychologists passed the following resolution on the death of Dr. ELIZABETH EVANS LORD, on January 10th. "Dr. ELIZABETH EVANS LORD contributed to the advancement of the profession of clinical psychology through her skilful collaboration with members of related professions, teachers, nurses, social workers, and physicians, and through her competence and integrity in psychological diagnosis and research. She was one of the founders of the Massachusetts Society of Clinical Psychologists, and as its second president, and subsequently as a member of the Board of Directors, ably served the interests of the Society, giving generously not only of her wisdom but of her friendliness, warmth, and humor. She will be remembered as an admired colleague and a beloved friend."

HERBERT WOODROW, professor of psychology at the University of Illinois, has been elected vice-president and chairman of Section I, Psychology, of the American Association for the Advancement of Science.

HAROLD E. BURTT, professor of psychology at Ohio State University, has been elected section committeeman for Section I, Psychology, of the American Association for the Advancement of Science for a four-year term, expiring in 1947.

On March 4–6 the Inter-Society Color Council, of which the American Psychological Association is a member body, held its annual meeting conjointly with the Optical Society of America at the Hotel Pennsylvania in New York. The subject of vision predominated at these meetings. A symposium of four invited papers on Vision was presented to the Optical Society. One paper was given by HARRY HELSON, a member of the APA on "Some Factors and Implications of Color Constancy." The ISCC arranged a symposium of eight invited papers on Color Blindness and Color Blind Tests. The APA was represented on this program by DR. ELSIE MURRAY with "The Evolution of Color Vision Tests," and by FORREST LEE DIMMICK with "Methodology of Test Preparation." The two symposia will be published together in the *Journal of the Optical Society of America* and reprints will be available through the Inter-Society Color Council. Among the contributed papers presented to the Optical Society were two for which SIDNEY M. NEWHALL was jointly responsible, "A Psychological Color Solid," and "Final Report on the Spacing of the Munsell Colors."

An announcement has been made of the award of two Westinghouse-Science Grand Scholarships of $2,400, and of eight Westinghouse-Science Scholarships of $400 each, and of 30 one-year scholarships of $100 each, to selected graduating seniors in high schools as a result of the second annual Science Talent Search conducted annually by the Science Clubs of America, and sponsored by Science Service and the Westinghouse Electric and Manufacturing Company. The aptitude examination, which was given to 15,000 students as one of the bases of selection, was designed by HAROLD A. EDGERTON and STEUART HENDERSON BRITT, who, with DR. HARLOW SHAPLEY of Harvard College Observatory, constituted the committee on the scholarship awards.

CLAUDE M. DILLINGER has succeeded RICHARD WILKINSON, now on leave of absence, as associate professor of psychology, Southwest Missouri State Teachers College, Springfield.

ELMER KINSEY KILMER has been appointed professor of psychology, Muhlenberg College, Allentown, Pa.

DR. GERTRUDE RAND has been appointed Research Associate in Ophthalmology on the Knapp Foundation, College of Physicians and Surgeons, Columbia University. Her office is in the Institute of Ophthalmology of the Presbyterian Hospital, 635 West 165th Street, New York City.

MARGARET G. MCKIM is now instructor in the psychological and biological foundations of education, Teachers College, Columbia University.

In addition to $10,000 appropriated by the APA and $1,000 supplied by the AAAP, the Society for the Psychological Study of Social Issues

has sent in $25 and the Society of Experimental Psychologists, $100 for the support of the Office of Psychological Personnel.

The Western Psychological Association will hold three sub-regional meetings this June, in place of its regular meeting. Since there will be no election, the officers of last year will continue to serve until the next general meeting. The sub-regional meetings planned are as follows: *1. Northwest.* Meetings at Oregon State College, Corvallis, in conjunction with the Pacific Coast AAAS, June 14–19. O. R. CHAMBERS, local chairman. *2. Bay Area.* Meetings at the University of California, Berkeley, June 12. E. C. TOLMAN, local chairman. *3. Los Angeles Area.* Meetings at the University of Southern California, Los Angeles, June 12. FLOYD RUCH, local chairman. It is hoped that psychologists in the armed services who are in these regions will participate in the meetings.

An appointment commencing in September as half-time Research Assistant in Psychology at $600 for ten months with tuition waived is available at the University of Illinois. The position is made possible by an American Medical Association grant for research upon appetite, food preference and dietary habit in the rat. The work will be supervised by PROFESSOR PAUL THOMAS YOUNG, Urbana, Illinois, to whom applications should go.

In a reorganization just announced, the Department of Experimental Biology at the American Museum of Natural History is changed to the Department of Animal Behavior. The scientific staff of the department is: DR. FRANK A. BEACH, Chairman and Curator; Dr. T. C. SCHNEIRLA, Associate Curator; MR. LESTER R. ARONSON, DR. ALBERT P. BLAIR, Assistant Curators; MISS A. MARIE HOLZ, Scientific Assistant; DR. LIBBIE H. HYMAN, DR. WILLIAM ETKIN, DR. CHARLES M. BREDER, JR., Research Associates. The two-fold function of the department is the conduct of research and the planning of exhibits. The research program, using both field and laboratory methods seeks the general principles revealed in the behavior of various animal groups. Current studies include work on invertebrates, fishes, amphibians, birds, and mammals. At present much research centers on reproductive behavior, with assistance from the NRC Committee for Research in Problems of Sex. Plans for exhibits designed to illustrate broad principles of animal behavior, and to emphasize the evolution of major reaction patterns have been approved. Such exhibits are conceived as enriching the visitor's understanding of the psychological aspects of animal life and increasing his perspective and understanding of human behavior.

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Psychological Bulletin

LEARNING TELEGRAPHIC CODE

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I. Introduction

The first studies of the learning of telegraphic code, those of Bryan and Harter (**4**, **5**), are familiar to the majority of psychologists. They have been frequently mentioned even in elementary textbooks in psychology. Yet apparently none of the studies published since those of 1897 and 1899 have received attention from more than a very few. This is true probably for two reasons. First, only 6 of the other 19 published articles concerned with the subject are in English. Secondly, most of the articles are published in reports and journals available only in a few libraries in this country. The present war with the resulting demand for the training of telegraphers in large numbers has given immediate importance to the study of the problems involved in the learning of code. This fact plus the fact that previous studies of such problems are relatively inaccessible makes it seem desirable not only to present a review of such studies here, but also to review them in somewhat greater detail than would otherwise be necessary.

Two different codes are in common use. The International or Continental Morse Code is used for radiotelegraphic communication in all languages using a Latin alphabet. For other languages, such as Japanese and Egyptian, special codes have been developed. They, however, need not concern us here. The International Morse Code is also used for wire telegraphy in Europe; in the United States the American Morse Code is used in wire telegraphy.

The International Morse Code and the American Morse Code are similar in certain respects but differ in others. Both are made up of two kinds of elements which are customarily called *dots* and *dashes*. But the particular combinations of dots and dashes representing given letters in one code differ from the combinations of dots and dashes representing the same letters in the other code. Furthermore, in the use of the International Morse Code in radiotelegraphy, a dot is a tone of a particular frequency (usually between 500 and 1,000 c.p.s.) which lasts for a certain length of time, its absolute duration varying with the rate of transmission.

Similarly, a dash is a tone of the same frequency but has a duration three times that of a dot. In comparison, in the use of the American Morse Code in wire telegraphy, a dot is an interval of silence whose beginning is indicated by the down-stroke of a telegraph sounder and whose end is indicated by the up-stroke of the sounder. A dash is an interval indicated in the same manner, but of longer duration. The operator who is doing the receiving must distinguish between the down-strokes and up-strokes of the sounder on the basis of difference in timbre.

Most of the studies to be reviewed here were concerned with the International Morse Code. In those few studies which dealt with the American Morse Code, specific mention will be made of the fact. Unless such mention is made, the reader may assume that the study being discussed was concerned with the International Morse Code.

Proficiency in the use of either code is ordinarily described in terms of the number of words per minute that an operator can transmit or receive. By definition five characters constitute a word. Thus, in order to compute the speed of transmission of a particular message, one merely counts the number of characters sent in one minute and then divides this number by five. The range of proficiency attained in the use of the International Morse Code is wide. It varies from the amateur standard of transmission and reception of meaningful material at 13 words per minute to the highest speed of reception on record, 75.2 words per minute. The minimum requirement for a first-class commercial license is the transmission and reception of meaningful material at 25 words per minute and of nonsense material at 20 words per minute.

It is to be remembered that the degree of proficiency indicated by any specified rate of receiving varies with the kind of material which was received at that rate. Recognition of this fact is found in the usual practice of distinguishing between the rate at which an operator receives meaningful material and the rate at which he receives nonsense material. However, it is apparent that the degree of proficiency indicated by a particular rate of receiving may also vary with the duration of the speed test and with the per cent of accuracy required. An operator of a given level of ability will be able to receive at a faster rate for two minutes than he will for ten minutes. His rate of receiving will be higher if only 90% rather than 100% accuracy is required. Perhaps somewhat less apparent is the fact that an operator will receive at a faster rate if the message contains predominantly characters short in duration than if it contains an equal frequency of all characters both long and short.

(The duration of one of the longest characters, zero, is 19 times that of the shortest character, the letter *E*.)

The following discussion will be divided into three parts. First, consideration will be given to those studies concerned with problems involved in learning to receive. Secondly, the studies dealing with problems arising in learning to send will be reviewed. Finally, attention will be directed to those studies concerned with the measurement of aptitude.

II. Learning to Receive

The Learning Curve

The pioneer studies of Bryan and Harter (**4**, **5**) were primarily concerned with the determination and explanation of the form of the curve representing progress in learning to receive the American Morse Code. Their published curves are familiar to psychologists as the earliest and best-known examples of the occurrence of plateaus in learning curves. The earlier study (**4**) presents an analysis of the progress over a period of about nine months of two students learning the code in a Western Union office. At that time the minimum speed required of an operator was 14.4 words per minute. Just before reaching this required speed, the receiving curves of both students showed a period extending over several weeks during which no progress occurred. At the end of such plateaus, both students again showed sustained progress. To check the validity of these results, Bryan and Harter conducted a questionnaire survey among a large number of men who had learned the code and also among four schools in telegraphy. The replies which they obtained led them to believe that the results described above were typical.

In the second study (**5**), Bryan and Harter advanced the hypothesis that "learning to receive the telegraphic language consists in acquiring a hierarchy of psycho-physical habits." They suggested further that plateaus represent the period during which a transition is being made from one order to the next in such a hierarchy. According to this point of view, a student first learns to receive letters, then words, and then phrases or sentences. There is no plateau in the early part of the receiving curve because the student learns to receive letters and to receive words simultaneously. The plateaus found, so they thought, represent the transition from receiving words to receiving phrases. To verify this

hypothesis, over a period of about six months Bryan and Harter tested a subject each week in receiving letters which did not make words, words which did not make sentences, and connected discourse. The results obtained, they felt, support the interpretation that plateaus occur during the perfecting of lower-order habits.

Although the curves of Bryan and Harter have been repeatedly presented as representing the usual course of learning in telegraphy, it is very doubtful that they are typical. In a thorough study completed in 1918, but unfortunately never published, Rees Tulloss (23) obtained rather conclusive evidence that plateaus are not a necessary characteristic of curves representing the learning of code. In an analysis of the progress of four students of the American Morse Code in one school and of the progress of 22 students of the International Morse Code in two other schools, he did not obtain a single learning curve showing a plateau.

Since Tulloss is the only man who has studied the progress of students of both codes, it is of particular interest that results obtained for American Morse Code were essentially similar to those obtained for International Morse Code. It is also of interest that two men who had been proficient in the use of the American Morse Code learned the International Morse Code no faster than those who had not had such prior experience.

Failure to find plateaus in such a large number of curves would seem to question seriously the hypothesis of Bryan and Harter. It would seem that while plateaus may occur in individual cases they are not a necessary characteristic of telegraphic learning curves. As Tulloss pointed out, the suggestiveness of the questionnaire used by Bryan and Harter may have influenced the replies which they obtained in their survey. Because of this, the actual occurrence of the plateau phenomenon may not have been as frequent as their survey led them to believe.

The hypothesis of a hierarchy of habits would lead one to expect that an operator would be able to receive disconnected words only at a much slower rate than he could receive connected discourse. Further, since a still lower order of habits would be involved, one would expect that an operator would receive nonsense material at an even slower rate than he could receive disconnected words. This is essentially what Bryan and Harter (5) found in their study of one subject. However, in analyzing the progress of 19 men attaining speeds even higher than that attained by Bryan and Harter's subject, Tulloss (23) found markedly different results.

The men were tested weekly on their ability to receive each of the following four kinds of material: (1) sentences, (2) disconnected words, (3) nonsense material with each character occurring as frequently as it does in ordinary language, and (4) alphabetical code, that is, nonsense material with an equal frequency of all letters. The proficiency of the students in receiving the various kinds of materials varied as the order in which they are listed above, with the rate of receiving material composed of sentences being highest. But in contrast to what would be expected on the basis of the hypothesis of a hierarchy of habits, the differences in rates of receiving among the four kinds of materials were relatively small.

Even more striking is the case of one student reported by Tulloss, who was given practice only on nonsense material but who was tested regularly on both meaningful material and on alphabetical code. He was consistently able to receive alphabetical code at a higher rate of speed than that at which he could receive the meaningful material. Likewise, Biegel (**2**) describes two students who were allowed to practice only with nonsense material. Both of these men also were consistently able to receive nonsense material at a higher rate than that at which they could receive meaningful material. Thus, it appears that the hypothesis advanced by Bryan and Harter is not acceptable. It seems probable that the rate at which one can receive different kinds of material depends at least in part on the relative amounts of practice one has had in receiving such kinds of material.

Tulloss (**23**) obtained one result which is worthy of particular note in passing. He raised the following question. If, for example, a man makes five errors in receiving 85 characters per minute, at what rate can he receive without errors? In a study of four students receiving nonsense material, he found that if a student could receive perfectly a certain number of characters at a given speed, the errors he would make in receiving characters at a higher speed would on the average be equal to the difference between the higher speed and the speed at which he could receive perfectly. Thus, if a student made five errors in receiving 85 characters per minute, he would in general be able to receive perfectly at 80 characters or 16 words per minute. This he found to be true up to a limit of 25% errors and a 25% increase in sending speed.

Thurstone (**20**) was interested not in the form of the learning curve, but in the change in variability of proficiency among the members of a group in successive stages of learning. He analyzed the progress of 165 men over a period of 72 hours of practice. The median speed reached at the end of this time was six words per minute. He obtained two results of interest. First, he found that variability in degree of proficiency among

the men increased continually throughout the 72 hours. Secondly, he found that the distribution of proficiency scores remained symmetrical in spite of the continuous increase in variability.

Difficult Characters

It is a matter of common knowledge among instructors in telegraphy that students seldom make mistakes in receiving certain characters, but have considerable difficulty with others. A partial explanation of this may be found in the fact that the patterns of dots and dashes representing the various characters vary in complexity. Thus for example, an *E* is one dot, whereas a comma is dash-dash-dot-dot-dash-dash. It may be that such differences in complexity make certain characters inherently easy and others hard to learn. Supporting this suggestion is the comment of Koch (**9**) that if five or six of the so-called difficult characters are placed together at one point in the initial learning of the characters, a short but distinct plateau will occur in the curve representing progress in learning. This would indicate that such characters must be in some way inherently more difficult.

Tulloss (**23**), however, has shown that at least one other factor is probably of importance. In a tabulation of the errors which 19 students made on speed tests, he found that there were individual differences in the characters frequently missed. Nevertheless, he noted that there were certain letters, such as *Z*, *Q*, *J*, *X*, and others, on which all students seemed to have difficulty. He advanced the hypothesis that the characters with which the students had the most difficulty were those on which they had actually received the least practice. Ordinary magazine articles, such as are commonly used for practice material, contain some characters much less frequently than others. An analysis of samples of practice material carried out by Tulloss revealed that those characters previously found to be most difficult were actually those occurring least frequently in the practice material. That the relative frequency of occurrence of individual characters in practice material is important is also indicated by an experiment carried out by Biegel (**2**). He gave two students equal practice on all characters until they had attained speeds of about 18 words per minute. At this point he found no differences in difficulty among the various characters for the students.

Improvements in the Teaching of Receiving

In one of the oldest methods of teaching receiving, and one

which is still in common use, the student is first given a visual chart containing the letters and numerals and their corresponding patterns of dots and dashes. Using this chart, he memorizes the code. He is then given practice in receiving meaningful material. The speed of transmission is gradually increased from day to day until the required speed is attained.

Tulloss (**23**) suggested certain changes in this procedure. On the basis of his experiments, he concluded that operators learn to receive individual characters as wholes, but never words or phrases. The thing determining progress, he felt, was the development of responses to individual characters. In support of this point of view, he found in one experiment that there was a direct relation between a given student's speed of reaction to individual characters and his proficiency in receiving. Over a period of weeks actual measurements of the reaction times to individual characters of a number of students revealed that whereas the reaction times of students making good progress were reduced to about 400 sigma, poor students showed reaction times between 800 and 1000 sigma. To facilitate the development of unitary perceptions of individual characters, he suggested that students should avoid the use of visual symbols and the use of the terms *dot* and *dash* in initially learning the code. In addition, he suggested that nonsense rather than meaningful material should be used for practice for two reasons. First, such material would concentrate the attention of the student on individual characters rather than on words. Secondly, nonsense material which contains an equal frequency of all characters avoids giving an excessive amount of practice on some characters and too little practice on other characters.

A further characteristic of the older method is that the durations of the dots, dashes, and spaces change with the rate of sending. This practice is based on the international agreement that the elements of the International Morse Code should have the following relative length:

(1) A dot is of unit length.
(2) A dash is equal to three units.
(3) The space between the component parts of any character is equal to one unit.
(4) The space between any two characters is equal to three units.
(5) The space between any two words is equal to five units. (The U. S. Army and the U. S. Navy have adopted the use of an interword space equivalent to seven units rather than five.)

Thus, for example, in decreasing the rate of transmission from 16 to 7 words per minute, the durations of the dots, dashes, and spaces would all be increased proportionately.

The first suggestion that it would be desirable to maintain constant the duration of the dots, dashes, and spaces within characters throughout the learning process appeared in two bulletins published in 1917 and 1918. These bulletins were concerned with the training in radiotelegraphy of conscripted men and were issued by the Federal Board for Vocational Education (**24**, **25**). Although no explanation was given, it was stated that from the beginning of learning, individual characters should be sent at the rate of 20 words per minute. Slower speeds should be obtained by increasing the spaces between letters and between words.

This recommendation next appeared in an article by Lipmann (**13**) in a manuscript prepared in 1920 but not published until 1928. He had recorded (**12**) the sending of an expert operator at 15 words per minute and at five words per minute and had found that the average duration of the dots, dashes, and spaces within characters was almost exactly the same at the two speeds. The operator decreased his rate of sending merely by increasing the intervals between characters and between words. This led Lipmann (**13**) to suggest, apparently independently, that the speed of transmission of individual characters should be held constant at about 20 words per minute during learning, and that only the duration of intervals between characters and between words should be varied.

Experimental support for this suggestion was presented in 1932 by Biegel (**2**). Working under a Gestalt orientation, he held that at high speeds each individual character has a distinctive Gestalt or rhythmic pattern. The expert operator perceives as unitary the patterns representing individual characters. Unfortunately, when dots, dashes, and spaces are all lengthened proportionately in sending at slower speeds, individual characters are no longer perceived as organized patterns, but are perceived analytically as so many dots and dashes. Biegel thought that this breakdown in organization occurred at about 16 words per minute. Thus, the older method of sending the characters initially at about six words per minute forces the student to learn the code analytically. Above a certain rate of transmission it is impossible to perceive the individual characters analytically. When the student reaches this point he must change his method of perception and learn to

perceive the characters as auditory temporal patterns. To avoid this difficulty Biegel contended that from the very beginning the student should be taught to perceive the characters as rhythmic patterns. This could be accomplished, he thought, by initially sending the individual characters at 20 words per minute. Messages, thus, would be sent at 6 words per minute by sending the individual characters at 20 words per minute and by greatly increasing the spaces between letters and between words. Because their use tends to foster analytic perception, visual symbols should be avoided. For the same reason the characters should not be referred to in terms of dots and dashes. To prevent the student from guessing at the message during the relatively long intervals existing between characters thus sent at slow speeds, only nonsense material should be used for practice.

Using the procedure just described, Biegel trained two students. One student reached the speed of 25 words per minute in 153 hours and the other in 176 hours. This Biegel compared to the progress of 41 students in the Post, Telephone, and Telegraph School in Amsterdam, Holland. There, the best student required 185 hours to reach 25 words per minute, the median student 297 hours, and the poorest student 405 hours. If Biegel's two students could be considered to be of average ability, then his method might be considered to be 44% more efficient than the older method. However, it is to be emphasized that these results are open to serious question, not only because Biegel used only two students, but also because his procedure differed in respect of other parameters in addition to the one supposedly being investigated. For example, the distribution of hours of practice differed markedly in the two groups. In addition, one group received group instruction, whereas the other received what was practically individual instruction.

Koch (9) agreed with Biegel that the perception of characters at high speeds is the perception of Gestalt patterns. However, two experiments which he performed seem to indicate that the breakdown in such patterns with a decrease in transmission speed comes not at 16 but at about 10 words per minute.

In one experiment he recorded the sending of four expert operators at a number of different speeds. These men had all been trained by the older method to maintain the relative durations of dots, dashes, and spaces as defined above. Yet the records showed that only at transmission speeds of ten words per minute and above did their sending actually correspond approximately to the proportions so defined. Below ten words per minute, the men all increased disproportionately the spaces between characters and between words.

In a second experiment he used the same four expert operators as subjects. Nonsense messages consisting of 30 characters each were auto-

of transmission of the individual characters. In the control class the individual characters were from the beginning transmitted at a speed of 18 words per minute and the messages were sent initially at slow speeds. In the experimental class the individual characters were from the beginning of learning transmitted at the same speed as the messages and the messages were sent initially at slow speeds. Contrary to what would be expected on the basis of the work of Lipmann (**13**), Biegel (**2**), and Koch (**9**), no significant difference was found between the speed of learning of the control class and that of the experimental class.

Taylor's second experiment was concerned with a comparison of the efficiency of two different orders of initially teaching the characters. Ordinarily, the characters are not taught one by one, nor are they commonly taught all at once. The usual procedure is to present the characters to the students in groups, each successive group of characters being mastered by the students before an additional group is presented. One common method is to teach together those characters which are most similar. This method, however, has been criticized. Characters which are most similar are those which are most difficult to discriminate. Therefore, it has been contended, teaching similar characters together makes the first stages in learning unduly difficult and confuses the student. Accordingly, some have argued that dissimilar rather than similar characters should be taught together.

To test the validity of this contention, an experiment was performed. The common method of teaching similar characters together was used in the control class, whereas in the experimental class dissimilar characters were taught together. No significant difference was found between the two classes in respect of speed of learning.

Taylor's third experiment involved a comparison of the relative efficiency of two different methods of reinforcement used in teaching the code. The procedure commonly used in teaching students to receive involves what might be called delayed reinforcement. Ordinarily, the instructor transmits practice material for a certain length of time. This period may be 2 to 4 minutes in the early stages and 15 minutes or longer in the late stages of learning. Then he stops and reads the material transmitted so that each student can check his own errors. Thus, the "reward" for correct responses and the "punishment" for incorrect responses is delayed until the instructor reads the correct message.

Many experiments have shown that immediate reinforcement produces faster learning than does delayed reinforcement. Accordingly, Taylor (**19**) developed a procedure for teaching code by immediate rather than by delayed reinforcement. During the early stages of learning, the instructor transmits the characters one at a time. The students are instructed to respond orally to the transmission of each character with the name of the character sent. Thus, not only is each man forced to make a response, but he immediately becomes aware of the correct response. In the later stages of learning, sentences are sent one at a time. Following the transmission of each single sentence, the message sent is read aloud.

Taylor (**19**) used the method of immediate reinforcement just described in teaching the control class and the usual method of delayed reinforcement in teaching the experimental class. Surprisingly, no significant difference was found between the speeds with which the two classes learned to receive.

Distribution of Practice

The length and distribution of practice periods would seem to be a consideration of major importance in the teaching of code. This problem, however, has thus far received no systematic experimental treatment. At present, in schools of telegraphy, students are frequently required to practice as much as three or four hours a day. That such a requirement is in the interests of efficiency may be questioned. Biegel (**2**) reported that he began teaching two students two hours each day, one hour before lunch and one hour after lunch. Because he felt that the second hour of practice accomplished little, he soon reduced the time spent to one hour a day. Koch (**9**) has suggested that the optimum length of practice periods is a half-hour, and that if possible the students should be given a half-hour of practice in the morning and a half-hour in the evening. These suggestions, however, await experimental test.

III. Learning to Send

The Learning Curve

Students ordinarily make much faster progress in learning to send than they do in learning to receive. For this reason the problems involved in teaching sending have appeared to be of less immediate practical importance. Probably because of this, the learn-

ing of sending has received much less attention than the learning of receiving.

Swift (18) in a study of the learning curve of one subject thought that he found evidence of the occurrence of plateaus. The experiments of Bryan and Harter (4) and of Tulloss (23), however, have shown that the typical curve representing progress in learning to send is of the usual negatively-accelerated form and displays no marked plateaus. It is to be noted that while in the first months of learning the sending curve rises more rapidly than the receiving curve, the receiving curve eventually crosses the sending curve. Expert operators can receive more rapidly than they can send.

Individual Differences

Although all operators are trained to attempt to send the dots, dashes, and spaces in the proportions as described above, actually most operators deviate to some extent from what might be called such ideal sending. Bryan and Harter (4) analyzed records of the sending of 16 operators by measuring the average durations of dots, dashes, and spaces. This analysis showed that the deviations of the sending of individual operators from ideal sending is not random. Rather, each individual shows certain consistent kinds and amounts of deviation. These consistencies persist although the rate of sending is varied and might be said to constitute an individual style of sending. Bryan and Harter found that it was actually possible to identify a particular unknown sample of sending simply by measuring the average durations of dots, dashes, and spaces and by comparing these measurements with comparable measurements for each of the operators who might have sent it.

Improvements in the Teaching of Sending

The chief problem in the teaching of sending is to teach the student to manipulate the key in such a way that the dots, dashes, and spaces produced all have the proper duration. This problem would seem to be of more importance than the attention given it would indicate.

Biegel (3) suggested that an automatic transmitter be connected in series with an electromagnet. The electromagnet would be so placed that when activated it would close a telegraph key. Thus, a message sent perfectly by the automatic transmitter would produce in the key all the movements ordinarily used in sending

the message manually. In the first stage of the learning, the student merely places his fingers on the key and feels the correct movements. Next, he attempts to send the message at the same time as the automatic transmitter. If he starts to make errors, his movements are corrected by the action of the electromagnet. In the third stage, an ordinary key is placed beside the special key. The student operating the ordinary key attempts to follow the movements of the special key. After 30 hours of practice in using this technique, one student was able to send eight words per minute with an almost perfect rhythm. This, however, hardly can be regarded as an adequate test of the method.

Fujimoto (**7**) raised the question of whether a specially designed silent key would lead to greater efficiency in sending than does the use of the ordinary type of key. Tests carried out on two operators (presumably using the Japanese code) showed that elimination of key sounds tends to give rise to disturbance of work rhythms and makes errors in sending more numerous. The subject using a silent key feels uncertain because of the lack of auditory cues. It is to be noted that the results of this experiment are directly applicable only to wire telegraphy where headphones are not used. In radiotelegraphy auditory cues are normally provided not by the sound of the key but by the production of the transmitted signal in the sender's own phones.

Taylor (**19**) devised a special tape for use in an automatic transmitter. The tape was so constructed that it would send a character three times followed by an eight-second pause, then send another character three times followed by another eight-second pause, and so on. The instructor, in using the tape in teaching sending, directed the students to attempt during the pause following each character to send the character just as they had heard it.

A common procedure in teaching sending is to have the students work in pairs, one man sending and the other receiving. To determine whether the method using the special tape was more efficient than this common procedure, Taylor (**19**) taught one group of men by one method and another group by the other method. Objective measures of the quality of sending taken before and after the experimental training period indicated that there was no difference in the efficiency of the two methods. These measurements also showed that, although students are given regular sending practice and although they appear to be able to send to and receive from each other proficiently, the quality of their sending may actually be relatively poor. Hence, as Taylor pointed out, the common belief that more difficult problems arise in teaching students

to receive than in teaching them to send may actually be incorrect and may arise from the fact that, while objective measures of the quality of receiving are easily obtained, similar measures of the quality of sending are rarely available.

Telegrapher's Cramp

Occasionally operators develop what has been called telegrapher's cramp. Although they may previously have been expert operators, with the onset of the disease they find it difficult if not impossible to operate a telegraph key. Smith, Culpin, and Farmer (16) carried out a thorough investigation of 41 telegraphers suffering from cramp and of 46 control cases. Both groups were given tests on a Kraepelin ergograph, a McDougall-Schuster dotting machine, and a piezograph (a telegraph key attached to a pressure-recording instrument). The tests showed that as a group the subjects with cramp were more susceptible to fatigue, less accurate in the use of the dotting machine, and used greater pressure in operating a telegraph key. However, there was considerable overlapping in the scores of the two groups, and many of the subjects with cramp made better scores than some of the control subjects.

Dr. Culpin made a medical examination of each of the cases with cramp and of each of the control cases. The variety of symptoms displayed by the cases with cramp was striking. Some experienced difficulty only in sending certain combinations of dots and dashes, while in other cases the disability was so marked that the arm affected could not even be used in such gross movements as digging with a shovel. Among the cases, onset of the difficulty occurred after 2 to 20 years of service. On the average the time of onset was earlier among the women than among the men.

The most important result of the medical examination was the discovery that 31 of the 41 cases with cramp suffered with symptoms apart from cramp that would lead to a diagnosis of minor mental disturbance or psychoneurosis. The symptoms included were those of anxiety, obsessions, and hysteria. Of the other ten subjects with cramp, one had an organic lesion and the remaining nine had no discoverable symptoms. Six of these nine subjects had no difficulty on the tests described above. Of the 46 control subjects, 15 had psychoneurotic symptoms of varying degree. These results seem to indicate that telegrapher's cramp is probably functional rather than organic in origin.

As Smith, Culpin, and Farmer point out, the following conditions of

the work of a telegrapher make it particularly exacting: (1) Speed and accuracy are required. (2) The receiving operator is always a potential critic. (3) The operator must frequently work in the presence of others. (4) Sending involves rapid delicate muscular movements easily disturbed by anxiety. (5) There is a rigid objective standard of attainment. (6) Characters once transmitted can not be recalled. Such conditions of work may well aggravate pre-existing psychoneurotic tendencies and lead to the development of telegrapher's cramp.

IV. Measurement of Aptitude

Men vary greatly in their ability to learn code, and a number of different attempts have been made to measure this ability. Thus far, primary emphasis has been placed on aptitude for learning to receive, the assumption being that if a man can learn to receive well, he can also learn to send. The practical importance of the measurement of aptitude is indicated by the fact that from 30 to 60% of unselected men beginning the study of the code in commercial and military schools fail to become proficient operators.

Mental Tests and Code Aptitude

During the first World War, Thurstone (**21, 22**) gave seven different tests of intelligence to 165 conscripted men. In 100 hours of practice this group of men attained an average receiving speed of 6.4 words per minute. The tests given together with the correlations obtained between scores on such tests and achievement in code were as follows: Opposites Test, .42; Analogies Test, .29; Gordon Directions Test, .27; Trabue Completion Test, .21; Spelling Test, .18; Arithmetic Test, .08; Sentence Test, .09. In addition, he gave a test of rhythm which showed a correlation of .48 with code achievement. This test was composed of 35 different patterns of dots and dashes sent at ten words per minute. The students were required simply to indicate the patterns perceived by recording the appropriate dots and dashes. The multiple correlation between code achievement and the five mental tests showing the highest correlation with code achievement was .53, not significantly higher than the correlation between code achievement and the test of rhythm alone.

Further study of the 165 men revealed that for this group correlation between achievement in code and amount of previous schooling was .00. The correlation between the age of the students and code achievement was −.09. No relation was discovered between the occupation of the student prior to conscription and his

progress in code. On the basis of all these results, Thurstone concluded that ability in telegraphy is probably a special ability.

Taylor (**19**) gave the Wells Revised Alpha Examination Form 7 to 59 men who in 40 hours of practice attained speeds ranging from 3 to 20 words per minute. The correlations obtained between the several tests and achievement in code were as follows: Total Alpha Score, .50; sum of scores on mathematical tests, .39; sum of scores on verbal tests, .42; Addition Test, .40; Arithmetic Problems Test, .15; Common Sense Test, .27; Same-Opposite Test, .38; Mixed Sentences Test, .22; Numerical Relations Test, .38; Word Relations Test, .38; Directions Test, .46.

Scholastic achievement scores were available for 52 of the 59 men studied by Taylor (**19**). The correlation between such achievement scores and achievement in code was found to be .22 and not significant at the 10% level as indicated by the *t*-test.

It is to be noted that the 59 men studied by Taylor represented a narrow range of intelligence, all of them being in the upper six per cent of the general population in this respect. Nevertheless, the results he obtained are of the same order as those obtained by Thurstone on a larger and more representative group.

The Analytic Approach

Lipmann (**12, 13**) pointed out that there were two possible approaches to the study of code aptitude, the analytic approach and the molar (*komplexe*) approach. In using the analytic approach, one first attempts to determine by analysis all the different special abilities involved in code aptitude. Next, one measures each special ability separately. Finally, one combines by some method all the part scores into one total score representing code aptitude. In using the molar approach, one does not attempt to analyze code aptitude into special abilities. Instead, one devises a test which involves the same abilities as code aptitude. By means of such a test one score is obtained which is taken to represent code aptitude.

Lipmann's own work (**13**) represents the most thorough analytic study made. On the basis of his own observations, he concluded that the following special abilities were all important in the work of an operator: (1) auditory sensitivity, especially between 500 and 1,000 c.p.s., (2) differential pitch sensitivity, (3) absolute tonal memory, (4) differential loudness sensitivity, (5) learning ability, (6) ability to recognize the same signal with variations in pitch and rhythm, (7) ability to distinguish very similar rhythms, (8) ability to receive each character as a character and to avoid tendency to fill in characters not clearly perceived, (9) speed of

reaction to characters, (10) ability to write down one character while listening for another, (11) ability to distinguish individual rhythmic patterns from the larger rhythmic whole, (12) ability to adjust to changes in working speed, (13) relative insensitiveness to distractions, and (14) ability to abstract signals from a background of constant or periodically recurring disturbance. For each of these special abilities Lipmann suggested certain testing procedures. However, apparently no validation of such procedures was ever carried out.

In the actual selection of personnel, Riefert (**15**) used, together with Lipmann's complex test to be described under the next section, tests of auditory sensitivity, of differential loudness sensitivity, and of memory for timbre. Unfortunately, he has reported no figures on the results obtained.

Klutke (**8**) used a battery of five tests. In the first of these tests, a narrative consisting of about 400 common German words was read at a constant rate. The task of the students was to write down the first letter of each word. The second test was like the first except that the words composing the sentences in the narrative were presented in a mixed-up order. In a third test, a series of proper names, the initial letters of which combined to make a meaningful sentence, was read at a constant rate. The task of the students was simply to listen, remembering each initial letter, and finally putting them all together to make the correct sentence. The fourth test used was a rhythm test similar to the one devised by Thurstone. The fifth was a test of differential pitch sensitivity. By use of the test battery, Klutke was able to predict correctly the 3 best students and the 15 poorest students among a total of 71 students tested.

Lahy (**11**) investigated the possibility of using tests for musical ability as prognostic of code achievement. To about 100 students in a radiotelegraphic school who had been previously selected on the basis of general scholastic ability, he gave four of the tests from the earlier form of the Seashore Tests of Musical Talent, repeating each test once. Correlations between code achievement and each of the double-length tests given were as follows: Pitch, .44; Rhythm, .45, Time, .22, and Loudness, .02.

Taylor (**19**) gave to 59 men all of the tests from Series B of the revised form of the Seashore Tests of Musical Talents. The correlations found between achievement in code and each of the tests given were as follows: Pitch, .56; Loudness, .33; Rhythm, .55; Time, .64; Timbre, .25; Tonal Memory, .56. He also gave three tests of auditory function devised by Karlin to 27 of the 59 men.

The correlations between such tests and code achievement were as follows: Rapid Spelling, .35; Haphazard Speech, .42; Singing, .38.

Taylor (**19**) gave still another test of auditory function, the Signal Corps Code Aptitude Test, to the 59 men whose progress he studied. This test is essentially a test of rhythmic perception and consists of 78 pairs of patterns of dots and dashes. The task of the individual taking the test is to record whether the two patterns making up each pair are alike or different. Although the test is widely used, men who have used it have reported informally that it is low both in reliability and validity and that certain of the items included in it are non-discriminating. In confirmation of these informal reports, Taylor found the test to have a reliability coefficient of .86 and a validity coefficient of .52.

Taylor (**19**) obtained scores for 32 of the 59 men on two tests involving speed of reaction. One was a controlled-association test and the other a digit-cancellation test. In both cases, a correlation of .45 was found between achievement on the test and achievement in code. A digit-symbol learning test given to the same 32 men failed to show a significant correlation with code achievement.

The Molar Approach

Lipmann (**12**) was the first to suggest that the progress of students over a period of months could be predicted on the basis of the speed with which they initially learned a particular number of characters. To 71 subjects he gave a certain amount of practice in learning five characters (k, m, r, s, v). He then gave them several one-minute receiving tests in which the duration of the individual characters was held constant (dot equal to .07 second) but the speed of transmission was varied from two to seven words per minute. The frequency of the transmission tone was 1000 c.p.s. Distracting tones of varying intensity and of frequencies between 600 and 900 c.p.s. were introduced during the tests in which the transmission rate was between four and seven words per minute. Lipmann computed percentile norms based on the 71 men tested and suggested that any one in the lowest 30% should be dropped. No report of a validation of the test is given. Rieffert (**15**) has reported using the test, but he also failed to report any measure of its validity.

Biegel (**1**) has used a test differing essentially from that of Lipmann in that it involves no prior learning period. In the first part of the test, only three characters are used. The students do not re-

cord the actual names of these characters, but designate them only as *1*, *2*, or *3*. Individual characters are sent at 20 words per minute.

The design of Biegel's test is rather elaborate. Six series of ten characters and two series of 30 characters are sent with one second pauses between the individual characters. This procedure is repeated with the exception that pauses of only 5/6 of a second are used. Then three series of ten characters and one series of 30 characters are sent with 4/6 second pauses separating the individual characters. This procedure is repeated once with 3/6 second pauses and once with 2/6 second pauses. The effect of shortening the duration of the intervening pauses is of course to increase the speed of sending, the range of speeds represented here being about 8 to 18 words per minute.

In the second part of the test only two characters are used. These two characters are "mirror images" of each other (*e.g.*, *F* and *L*, dot-dot-dash-dot and dot-dash-dot-dot). Three series of ten characters were sent with one second pauses between the individual characters. This procedure was repeated successively with 5/6, 4/6, 3/6 and 2/6 second pauses. The entire test procedure was repeated three times to increase the reliability and to allow for practice effect. The results showed that the test series with one second and 5/6 second pauses were non-discriminating and might well be dropped.

Biegel gave this test to three different classes in the Post, Telephone and Telegraph School in Amsterdam. The classes were composed of 17, 21, and 18 students respectively. On the basis of the results he listed in rank order the students of each class. In the first class he set the criterion score arbitrarily at 78% correct so that 40% of the students received a prognosis of "good" and 60% of "poor." Use of the same criterion score in the second class gave 57% a prognosis of "good" and 43% of "poor." For the third class the criterion score was arbitrarily set at 72% so that 40% received a prognosis of "good" and 60% of "poor." Of the 56 students 34% were actually successful and 66% failed. Of the 27 who had been given a prognosis of "good" by the above procedure, 16 were successful and 11 failed. Of the 29 receiving a prognosis of "poor," 26 actually failed and 3 were successful. The prognosis thus was incorrect for 14 out of 56 students. The question may be raised as to whether it would not have been more valid to use the same criterion score for all three classes. On the basis of these results the test was adopted for use in personnel selection by Post, Telephone and Telegraph.

It should be noted that the 56 students to whom Biegel's test was given had been previously selected from among about 200 candidates on the basis of their scholastic record and a half hour interview. In spite of such prior selection 66% of them failed. This makes it appear extremely doubtful that either the knowledge of previous school record or the half hour interview was of any value in this particular instance for the selection of men for training.

Although he was not directly concerned with the measurement of aptitude, Koch's (9) method of teaching the code was such that he could observe the speed with which individual students learned the first few characters. On the basis of such observation he concluded that students who in the first two half-hour practice periods did not learn to receive four characters at 12 words per minute never were able to learn the code. He concluded further that if one observes progress during four half-hour practice periods, one can not only pick out the inapt, but one can also pick out those who will do very well and those who will be only average students.

Taylor (19), following the suggestion of Lipmann and Koch that achievement in code can be predicted on the basis of the speed of initial learning, constructed the Initial Learning Test. The test was designed to provide one measure of the speed with which students learn the first eight characters presented to them. As a part of the test, the students were given a half hour of practice under controlled conditions in learning eight characters previously unknown to them. Then a 100-item test lasting about 20 minutes was given to determine how well each student had learned the characters. The entire Initial Learning Test, including the instructions, the practice material, and the test itself, was presented by means of phonographic recordings.

When given the test during their first hour of practice, 59 men made scores ranging from 12 to 100 with a mean of 68.7 and a standard deviation of 25.2. The results obtained by Taylor indicate that the test is adequate both in respect of reliability and in respect of validity for use in the selection of personnel, the coefficient of reliability being .97 and the coefficient of validity .73.

Of the 59 men to whom the test was given, 9 were judged to be inapt on the basis of their performance on the test. On the basis of actual achievement in learning code, 9 men were found to be inapt. Of the 9 men judged inapt on the basis of the Initial Learning Test, 7 were actually inapt. In other words, 2 students judged inapt were actually apt, and 2 judged apt were actually inapt. Thus, predictions made on the basis of the test would have been correct for 55 out of the 59 men or 93% of the students.

Similarly, the best among the 59 students could be picked out on the basis of their test performance. The 6 best all made scores of 94 or above on the Initial Learning Test. Of the 14 best, 10 made scores of 90 or above, and the other 4 made scores above 65.

Thus, the Initial Learning Test seems to be the most promising

test yet developed* for use in the selection of men for training in code.

German Military Psychology

For the sake of completeness attention should be called to the work of three German military psychologists, Dietsch (**6**), Kreipe (**10**), and Mierke (**14**). Their studies were based only on personal observation and although they disagreed with previous writers at certain points, they presented no experimental evidence to support their contentions. However, certain of their suggestions are worthy of experimental test.

According to Dietsch (**6**) three factors are of importance in telegraphic aptitude: Empathic ability (*einfühlende Hingabemöglichkeit*), auditory ability, and intellectual apprehension. Disagreeing with all previous writers, Dietsch argued that tests should be discarded and that observational techniques should be used for the investigation of aptitude. Such techniques should be used in the examination of each candidate to determine: (1) Whether auditory or visual orientation is predominant, (2) whether susceptibility to auditory perception is free or willfully inhibited, (3) whether auditory reception is sustained even at high speeds, (4) whether assurance is shown in receiving rhythmical patterns, (5) whether received rhythmical patterns are perceived as organized, (6) whether the perception of rhythmical patterns is immediate or is mediated by intervening mental processes, and (7) whether the candidate is conscientious, reliable, and interested in the work.

Kreipe (**10**) attacked the hypothesis that measurements of differential sensitivity for pitch, for loudness, for timbre, and for duration will be correlated with achievement in code. He argued that all normal people have much greater sensitivity in each of these respects than is required in receiving code. However, the one ability which he thought to be important was the ability to distinguish similar auditory temporal patterns. Although he makes no reference to the Signal Corps Code Aptitude Test, the test which he proposed be constructed to measure the ability in question was very similar to it.

Strangely enough, Mierke (**14**) disagreed sharply with the suggestion that rhythmic ability is related to achievement in learning to receive. He pointed out that the code consists of long and short sounds which are irregular in their recurrence. Because of this, he argued, the code is arhythmic, and rhythmic ability has nothing in common with the learning of the code.

* In the latter part of 1942 the National Defense Research Committee established a project to develop a code aptitude test and to deal with other problems involved in training operators. The project, with headquarters in Chicago, is under the direction of Dr. Albert K. Kurtz. He is assisted by Dr. Harold Seashore and Dr. John Willits.

Mierke (14) stressed the importance of characterological factors, temperamental factors, and intelligence. In addition to possessing the necessary amount of intelligence, an operator should be careful, thorough, self-confident, reliable, and conscientious. Furthermore, he should have a temperament adapted to telegraphic work. Mierke thought that men with extreme or bizarre temperaments, including manic, neurasthenic, indolent, or meditative persons would not make good operators.

V. Summary

Problems involved in the learning of telegraphic code may be divided into three groups, those concerned with learning to receive, those concerned with learning to send and those concerned with the measurement of aptitude.

Although Bryan and Harter thought that plateaus typically occurred in curves representing the learning of receiving, experimental evidence obtained by Tulloss indicates that the occurrence of such plateaus is the exception rather than the rule. The fact that some characters tend to be more difficult to receive than others may be due in part to their inherent complexity and in part to the fact that such characters occur relatively infrequently in meaningful material and hence receive an inadequate amount of practice.

Tulloss, Biegel and Koch have all recommended that in teaching receiving the use of visual symbols should be avoided, that individual characters should not be referred to in terms of their component dots and dashes, and that nonsense rather than meaningful material should be used for practice. Lipmann and Biegel suggested that from the beginning of learning individual characters should be sent at about 20 words per minute. Koch contended that learning should begin with messages sent at 12 words per minute and containing only two characters, additional characters being added one at a time.

Taylor, however, in a carefully controlled experiment found that whether the individual characters were sent initially at a high speed or at relatively slow speeds made no difference in the speed with which men learned to receive. In two other experiments, he found that it made no difference in the speed of learning (1) whether similar or dissimilar characters were taught together during the initial learning period, or (2) whether immediate or delayed reinforcement was used in teaching the men to receive.

The typical curve representing progress in learning to send is of the usual negatively-accelerated form. Different operators

show consistent individualistic deviations from ideal sending such that each operator's sending may be identified on the basis of his individual style. Biegel suggested that a special key operated by an electromagnet be used to teach sending, but the use of such a key has not been adequately tested.

Taylor devised a special tape for use in an automatic transmitter. The tape was so constructed that each character was sent perfectly followed by a pause during which the students could attempt to imitate the character sent. Taylor, however, found that the use of the tape in teaching sending produced no more efficient results than the usual method of having the students practice by sending to each other.

Smith, Culpin, and Farmer carried out an investigation of 46 telegraphers suffering from cramp and of 46 control cases. The results which they obtained showed that as a group the operators with cramp were more susceptible to fatigue, less accurate in the use of a dotting machine, and used greater pressure in operating a telegraph key. However, there was considerable overlapping in each of these three respects between the operators with cramp and the operators in the control group. A medical examination revealed that 31 of the 41 cases with cramp suffered with symptoms apart from cramp that would lead to a diagnosis of minor mental disturbance. Only 15 of the 46 control subjects showed such symptoms. These results led to the conclusion that telegrapher's cramp is probably functional rather than organic in origin.

Thurstone gave seven different intelligence tests to 165 men and found correlations between such tests and code achievement ranging from .08 to .42. His results also indicated that achievement in code is not correlated with the age, amount of previous education or prior vocation of the students.

Taylor found a correlation of .50 between the achievement of 59 men in code and their performance on the Wells Revised Alpha Examination Form 7. The correlation between such achievement and the sum of the scores on the individual mathematical tests was about equal to that between such achievement and the sum of the scores on the individual verbal tests. He found no significant correlation between the scholastic achievement of 52 men and their achievement in code.

Lipmann listed 14 different special abilities which he thought to be involved in the learning of code. However, he presented no evidence adequate to support his suggestions. Klutke constructed a

battery of five tests which he used with some success to predict achievement in code.

Results obtained by Lahy showed that performance on the Seashore tests of pitch and rhythm is significantly correlated with code achievement. Similarly, Taylor found correlations of the order of .56 between such achievement and the Seashore tests of pitch, rhythm, time, and tonal memory.

Although the Signal Corps Code Aptitude Test is widely used, men who have used it report informally that it is low both in reliability and validity. In confirmation of these informal reports, Taylor found the test to have a reliability coefficient of .86 and a validity coefficient of .52.

Biegel has devised a test which measures a student's ability to distinguish characters without prior learning. Results obtained in using it indicate that it may be of some value for use in predicting achievement in code.

Taylor, following the suggestion of Lipmann and Koch that achievement in code could be predicted on the basis of speed of initial learning, constructed the Initial Learning Test. This test, designed to measure the speed with which students learn the first eight characters presented to them, seems to be the most promising test yet developed for use in the selection of men for training in code. When given to 59 men, it was found to have a coefficient of reliability of .97 and a coefficient of validity of .73.

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CONTENT OF THE FIRST COURSE IN PSYCHOLOGY

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In Wolfle's recent survey of the literature on the first course in psychology (**10**), the following statements occur: "The many elementary texts constitute one of the most easily available sources for the beginner to use in deciding upon the content of his course. . . . Outlines of carefully worked out courses have been published by Dashiell, Dockeray . . . " (**10**, p. 697).

These sources are valuable in suggesting to the instructor possible content for his course. As detailed descriptions of what is actually taught, they are quite inadequate. Analyses of the content of elementary textbooks (**1**, **2**) might show what is taught if there were some assurance that instructors followed faithfully the textbooks they used. If instructors deviate appreciably from assigned textbooks—in order of topics treated, in interpretations of experimental data, in point of view, in proportional emphasis on the various topics, even in inclusion and omission of topics—such analyses become inadequate in proportion to the amount of deviation.

Published outlines of courses as actually taught are more promising, provided that they represent realities and not just hopes. Some of those cited by Wolfle are now outmoded, and others are too sketchy to be very revelatory.

The present paper exhibits a new approach to the problem of describing the content of the first course in psychology. It asks: Is not the content of the course what the student is expected to know of it? And are not those expectations embodied in the examinations he must take? Certainly, the level-headed student, who is an operationalist in this respect, knows that nothing in the course need concern him no matter how much zeal the instructor manifests over it, unless it can be translated into an examination question which he must answer true or false.

Whether that attitude is justified or not, it suggests a possibility for the investigator. May not a representative picture of the first course be obtained through an analysis of the examinations given in such a course? For the value it may have to those who wish to evaluate psychological offerings, the following results, obtained by analyzing final examinations of twenty-seven Pacific Coast institutions, are presented.

Source of Data. Requests were sent May, 1941, and again May, 1942, for "copies of the final examinations you have given your students in elementary general psychology the past year or two." The results, thus, represent normal, peacetime conditions. As Table I shows, the state universities of the three Pacific Coast

TABLE I
INSTITUTIONS REPRESENTED

	State Univ.	State Colleges	Private Univ. & Colleges	Denominational Colleges	Public Junior Colleges	Total
No. of requests sent	4	5	10	4	17	40
No. of responses	3	4*	7	1	12	27
%	75	80	70	25	71	67.5
No. of exams. tabulated	3[a]	3[b]	7[c]	1[d]	13#[e]	27
% of total	11.1	11.1	26	3.7	48.1	100

[a] California, Oregon, and Washington.
[b] Fresno, San Diego, and San Jose.
[c] College of the Pacific, Mills College, Occidental, Pomona College, Scripps, Southern California, Stanford.
[d] University of San Francisco.
[e] Bakersfield, Compton, Glendale, Long Beach, Los Angeles City College, Modesto, Pomona Junior College, Sacramento, San Bernardino, Santa Ana, Santa Monica, Santa Rosa, Ventura.
* Including Chico State College, which does not give a final examination in psychology.
\# Including Compton Junior College.

states are represented. In addition, seven California private universities and colleges, large and small, are represented. Of these, two are women's colleges, and one is a men's college. Thirteen junior colleges which give the elementary psychology course are represented. Three state colleges, which prepare many students for teaching, are included. A denominational college (Catholic) is included to round out the picture.

Distribution of Specific Items. The total number of true-false, multiple choice, and other type questions in the twenty seven examinations was 5306, distributed as follows: 600 in the state universities, 550 in the state colleges, 1489 in the private universities and colleges, 30 in the denominational college, and 2637 in the junior colleges. Of this number, 180 questions were unclassifiable because of ambiguity. The remainder, 5126, were distributed among specific topics as tabulated in Table II.

TABLE II

DISTRIBUTION OF QUESTIONS AMONG SPECIFIC TOPICS

Topic	Number	%
1. learning, memory	460	8.99
2. abnormal psychology, mental hygiene, conflicts, adjustment	450	8.78
3. sensation	397	7.71
4. emotion	366	7.15
5. statistics, individual differences, tests and measurements	362	7.07
6. intelligence	338	6.60
7. perception, attention, observation	293	5.72
8. history of psychology, contemporary psychology, names and dates	245	4.77
9. thinking	245	4.77
10. motivation	243	4.75
11. heredity, environment, maturation	228	4.44
12. motor responses, reaction time, skills	190	3.71
13. social psychology: crime, war, propaganda, race prejudice, labor warfare, suggestibility, hypnotism, public opinion	186	3.64
14. nervous system	178	3.46
15. glands	158	3.08
16. personality: personal relations, marriage, friendship, abilities	149	2.92
17. industrial psychology, business psychology, personnel, morale, work efficiency, vocational guidance	118	2.30
18. philosophy of mind: definition of psychology, schools of psychology, psychology in relation to other sciences	98	1.91
19. imagination, imagery	94	1.83
20. scientific method, methodology	88	1.72
21. educational psychology	71	1.38
22. child psychology, adolescence	65	1.27
23. comparative psychology, animal psychology	45	.88
24. experimental psychology: apparatus, procedures	42	.82
25. esthetics	12	.23
26. evolution	5	.10

The topic appearing with greatest frequency is learning. The five next most frequent topics are, in order, abnormal psychology, sensation, emotion, statistics, and intelligence. The topic which appears least frequently is evolution. The five next infrequent topics, in order, are esthetics, experimental psychology, comparative psychology, child psychology, and educational psychology.

Evidently, then, the standard topics still lead psychological offerings. There is, in addition, an emphasis on abnormal psychology, especially as it relates to mental hygiene and the elimination of personality conflicts. Evolution and esthetics are considered infrequently as are also the fields of specialized interest: animal psychology, child psychology, experimental psychology, and educational psychology. The topic of the nervous system, a bone of contention in the recent discussions, is halfway down the list, occurring with moderate frequency.

Distribution among General Categories: Theoretical vs. *Practical.* It is not sufficient to know *what* specific topics are discussed in the first course: we need to know *how* they are treated. With respect to "learning," *e.g.*: are theories discussed, or is the emphasis on practical techniques? Is the topic dealt with to a great extent in neurological terms (neural passages, synapse, conditioning) or in terms of "insight"? Are references mainly to experiments with animals or to experiments with humans?

Hence, as the items were classified with respect to specific categories, they were at the same time classified with respect to general categories.

The first of these is relevant to the question, Should the first course be scientific in tenor and logical in organization, or should it be adapted to the interests of the student?

Wolfle (**10**, p. 688) believes that the major objective of the first course should be "to teach the facts and principles of psychology." Hence, he concludes, "the mere fact that students find a topic interesting is never justification for including it in the course" (p. 695). Pratt fears that psychology is today losing character because of "the substitution of sales appeal for scientific adequacy and impartiality in the selection of content for textbooks" (**5**, p. 366). He doubts the wisdom of orienting a course around the "felt needs" and "interests" of students, since, he feels, the existence of a "felt need" does not guarantee that its satisfaction will be beneficial to the individual. Moreover, a course organized around students' interests, which are frequently "capricious and accidental," tends to repel the really serious and able student, who forms a "low opinion of the integrity of psychology as a science and turns to other fields for sober, scientific work" (p. 369). Similarly, Ewert objects that Vaughan's use of humor in his *General Psychology* is undignified. In fact, he adds, "We have no conclusive evidence for the value of humor in pedagogy" (**3**, p. 174). The fear of these critics that the scientific standing of psychology will be impaired by attempts to make it interesting and practical duplicates a similar fear which hindered the development of applied psychology in the early years of this century. Hollingworth refers to "those days when applied psychologists were pariahs whom the anointed could scarcely tolerate in the temple" and when "applications" of psychology to any field beyond education were considered "unclean" (**4**, pp. 307, 308).

The opposed point of view is defended by Schoen, who says, "Psychology should be the most vital course in the college curriculum. . . . Our pride should not be so much that we are teaching psychology as a science, but, rather, that we are teaching psychology as life" (**9**, p. 595). He believes the course should help the individual in the business of living. In 1926 he wrote thus, and his statements proved a harbinger of a new trend. Writing in 1939, Emme reported that "the prevailing trend (in elementary textbooks) is in the direction of adapting the material to the present needs and interests of students" (**1**, p. 293). Ewert, too, reports:

"If we are to compare general psychology textbooks of today with those of from ten to twenty years ago, we note an undeniable trend toward . . . . popularization" (3, p. 173).

In the present investigation, items were divided into those of practical value and those of theoretical value. An example of an item of theoretical value is:

Cannon's theory of emotion assumes that emotion depends on (1) thalamic control; (2) peripheral responses; (3) sensations or feelings; (4) visceral changes; (5) postural alterations.

An example in the same field of an item of practical value is:

Childish fears are almost invariably outgrown.

An item was classified as theoretical if its main function appeared to be to promote an understanding of human nature, irrespective of the probable usefulness of that understanding. Such items emphasize the significant, fundamental facts of systematic importance. Cannon's theory of emotions, *e.g.*, helps us to understand the physiological locus of emotions, but M. C. Jones's experiments on unconditioning children's fears suggest a solution of a practical problem. Practical purposes which items sought to serve included making students better learners ("To study efficiently a person must be relaxed"), better thinkers ("A syllogism is invalid if its conclusion is false"), and better parents ("A child who receives early training in walking will always retain an advantage over children his own age in this skill").

Items from the various types of institutions were classified separately, to make comparison possible.

As the results given in Table III show, the junior colleges are especially responsive to the increasing demand that psychological offerings be oriented toward practical needs and interests. Practical items occur twice as frequently as theoretical items in the junior college examinations. The state universities and state colleges continue to emphasize material of theoretical interest primarily, the proportion in the former case being three to one.

No doubt, the task of preparing students for advanced work in psychology is a differentiating factor here, since presumably the universities and colleges concern themselves considerably with that task while the junior colleges give it relatively little attention.

Speculative vs. *Introspective* vs. *Experimental.* Since those who object to orienting psychology around practical values do so for fear its scientific rigor will be impaired, it is desirable to consider the sources of the items found in the examinations. Are they the

TABLE III
CLASSIFICATION OF EXAMINATION ITEMS BY VARIOUS CATEGORIES*

	State Univ.	State Coll.	Private Univ. & Coll.	Denominational Colleges†	Public Junior Coll.	Total
Theoretical	74.5	54.5	49.8	80.0	34.5	46.0
Practical	25.5	45.5	50.2	20.0	65.5	54.0
Speculative	31.0	17.6	14.1	86.2	8.9	14.2
Introspective	8.5	1.9	7.9	10.3	9.0	8.0
Experimental	60.5	80.5	78.0	3.5	82.1	77.8
Biology	7.7	8.6	6.6	3.3	8.0	7.7
Philosophy	4.6	2.6	2.9	63.4	3.1	3.6
Psychology	84.2	83.1	86.1	33.3	84.2	84.2
Others	3.5	5.7	4.4	0.0	4.7	4.5
Individual	61.5	33.6	52.2	50.0	44.0	46.5
Social	38.5	66.4	47.8	50.0	56.0	53.5
Terminology	11.7	14.9	12.8	6.7	12.2	12.5

* All figures are percentages.
† Only one institution.

results of experimentation and observation, do they derive from introspection, or are they speculative in nature?

An example of an introspective item is:

The negative after-image of yellow is blue.

An example of a speculative (philosophical, derived through reason, dialectical) item is:

A science seeks general laws; therefore psychology can not be a science since it studies the individual.

Items expressing psychological theories which extrapolate far beyond experimental or introspective data were also classified as speculative. *E.g.*, "Self-love is one of the earlier stages in the growth of the sexual emotion" will be recognized as a Freudian speculation. The various theories of emotion and of color must also be classified as speculative in origin, although, to be sure, they rest to an extent on an experimental basis. The examination from the one Catholic institution contained many questions on mind as substance, immortality, the origin and evolution of mind, mechanism *vs.* vitalism, and the like. These are obviously speculative, philosophical questions.

The next panel of Table III contains the data on the source of items.

The results show that all types of institutions recognize the

importance of grounding psychological generalizations on experimental foundations, except where parochial interests maintain a speculative orientation.

It is of interest that in the junior colleges, which emphasize practicality, experimental items, too, lead by far. Thus, it is demonstrated that it is possible to maintain scientific rigor of presentation and at the same time orient material around vital needs. Consider, *e.g.*, the following item:

> In studying new material, it is better to study intensively each new part as it comes than to skim superficially over the whole.

It fills a need which students feel for guidance on efficient study habits; yet it also represents "sober, scientific work," based upon many rigorous experiments.

Biology vs. *Philosophy* vs. *Psychology* vs. *Other Disciplines.* For a long time, says Pressey, psychology sought for scientific standing by emphasizing its affiliation with biology, neurology, and physiology (6, p. 393). Today, as Emme reports, "there is less emphasis being given to the physiological backgrounds" (1, p. 293). Psychology can stand on its own feet by concerning itself with specifically psychological material and yet be scientific as well.

To what extent do psychology examinations test for specifically psychological material? Do they still rely on biology? *E.g.:*

> Two individuals derived from the same fertilized ovum have the same heredity.
>
> Without cortin, premature death occurs.

Or philosophy?

> All any study needs to become a science is to make systematic generalizations based on careful observations.

Or even physics?

> Fabrics dyed in red, orange, or yellow absorb more heat than fabrics dyed in other colors.

In general, items of a biological nature come from neurology ("dendrite," "synapse," "thalamus," etc.), the physiology of the endocrine glands, and genetics ("siblings," "identical twins"). Items of a philosophical nature mostly concern methodology and the nature of scientific method. Items from physics concern the action of light rays when refracted by the lens of the eye and the physical characteristics of sound waves and light waves. In some instances many items from sociology and economics are found: *e.g.*, the average age at marriage, incidence of feeblemindedness,

birth rates among different groups of the population, average incomes, and the like.

The next panel of Table III contains the data on the fields of study to which the items belong.

It appears that although almost 8% of psychological items are still drawn from biology, on the whole current courses in psychology preserve their scientific character without borrowing to any embarrassing extent from the other sciences or from philosophy.

The Isolated Individual vs. *Social Orientation.* To what extent are psychologists concerning themselves with social problems? Do they concern themselves with perception, thinking, learning, etc. as individual responses exclusively, or do they emphasize the social aspects of these responses? Do they attempt to bring psychological facts to bear on social problems: crime, war, poverty, industrial conflict, morale, propaganda, and race prejudice? Textbooks like those of Ruch (8) and Pressey, Janney, and Kuhlen (7) contain much material drawn from the social sciences. Pressey believes that psychology is "faced with one of the most critical choices in its history" (6, p. 393): namely, as he puts it, between "fundamentalism, isolationism, and biological pedantry" on the one hand and "socio-cultural orientation" on the other.

A typical item relevant to an isolated individual is:

Even without intent to learn, practice makes perfect.

This item tests the awareness of the student that interest and motivation are indispensable to learning. Applied to a social situation, it becomes:

A student usually learns more by studying subject-matter that is logically presented than by studying practical problems.

In this form, it is of special relevance to the science of education.

Other items carrying social import are:

The average convict is as intelligent as the average man, according to Murchison.

On the whole, poverty is not a serious obstacle to the development of a wholesome personality.

The data with respect to the social orientation of the examination items are found near the bottom of Table III. As these data show, the junior colleges and state colleges succeed in giving psychology considerably more of a socio-cultural orientation than any of the other institutions. In all cases, however, the individual as a social organism gets generous attention.

Terminology. One large group of items which seemed to call for

special attention was a group of questions on terminology: *e.g.*, Limen means (1) threshold, (2) apparatus, (3) obstruction, (4) pain.

The frequencies with which terminology questions appear are shown in the lowest section of Table III.

Questions on terminology constitute, on the whole, 12.5% of all the items on the examinations. Such questions would seem to be of value primarily to those who expect to read extensively in scientific psychology. Is there not a tendency on the part of some instructors to confuse statements about the *language* psychologists use with statements of psychological *fact?*

Summary. To supplement Wolfle's able discussion of the first course in psychology, the present paper presents data obtained from analyzing the final examinations given in the first course at twenty-seven Pacific Coast institutions. After showing the distribution of the items in terms of topics, an analysis is made in terms of categories, which shows that junior colleges tend to emphasize the practical item as compared with the theoretical item emphasized by the state college and university; and that junior colleges and state colleges give more emphasis to socio-cultural items than do universities. Institutions of all types, except the one denominational college studied, stressed experimental over speculative and introspective items and psychological over philosophical and biological items. The proportion of terminological items is fairly constant in the different types of institutions.

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PSYCHOLOGY AND THE WAR

Edited by

STEUART HENDERSON BRITT

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PERSONNEL RESEARCH IN THE ARMY

VI. THE SELECTION OF TRUCK DRIVERS

BY STAFF, PERSONNEL RESEARCH SECTION, CLASSIFICATION AND REPLACEMENT BRANCH, THE ADJUTANT GENERAL'S OFFICE

In modern mechanized warfare, where operations are spread out over wide areas and the element of mobility may be decisive, heavy demands are made on the Army's transportation and communication facilities. Specialists in these fields must be developed on such a large scale that the peacetime reservoir of trained personnel is rapidly drained. Research of the Personnel Research Section on the communications problem was described in a previous article in this series, *The Selection of Radiotelegraph Operators* (**2**); the present article describes research on the selection of truck drivers.

Approximately forty studies, carried out in several Army installations, yielded the results to be summarized here. In some of these studies individuals and organizations outside the Army aided in loan of apparatus and the giving of tests and ratings. The problems encountered and some indication of the results to date can be arranged under three headings: criteria of driving ability, possible predictors, and validity of the predictors. Some of the tests to be mentioned herein are described briefly in manuals published by the War Department (**3, 4, 5**).

Criteria of Driving Ability

The criterion most frequently used by the Army is an actual road test. This road test usually consists of fifteen to twenty minutes observation of the driver in a standardized situation by one or more examiners. Specified tasks are set up, errors in which can be observed and recorded with some objectivity, *e.g.*, shifting gears downhill and steering forward and backward through a narrow crooked lane. The latest revision of the Road Test Check List contains 47 such items. Two kinds of data are obtained from the road test: the number of check-list items checked as unsatisfactory—or the sum of the item weights—and a general or overall rating of driver skill. Estimates of the reliability of the criterion data in various samples have been obtained from (1) correlations between scores on the Road Test Check List and general ratings, (2) split-half correlations of scores on the Road Test Check List, (3) correlations between check-list scores given by different examiners, and (4) correlations between general ratings given by different examiners.

A large sample of ratings of Army truck drivers were collected in an early study (spring, 1941) under the direction of Dr. Harry R. DeSilva, as representative of the American Association of Motor Vehicle Administrators. When analyzed by the Personnel Research Section, these showed the usual variation of ratings between examiners* but indicated that some relationship existed between the check-list scores and the general ratings. Further exploration of the relationship between the separate check-list items and the general ratings, using records of 1,717 road tests, showed tetrachoric correlations ranging between .22 and .57. Some of the items showing the closest relationship to the general rating are "fails to use proper gear uphill," "fails to use proper gear downhill," "does not doubleclutch," and "coasts back on turnabout." Scores for the Road Test Check List can be weighted on the basis of these tetrachoric correlations. Correlations between such weighted scores and general ratings have varied in samples of one hundred to two hundred from .51 to .82. But an unweighted score, the number of "unsatisfactory" checks, correlates equally well with the general ratings, as shown by a correlation of .83 in a more recent study of 1,928 cases. These results indicate that the examiner's general rating and his checking of the separate items, whether weighted or not, are fairly consistent with each other.

The split-half reliability of the Road Test Check List, using the Spearman-Brown formula, has been computed as .82 in a sample of 155 cases. When computed by correlating scores given by different examiners at different times, the reliability is .53.

One attempt was made to improve the reliability of the check list in the direction of greater objectivity and quantification. Counts were made of the number of blocks knocked over, and measurements were made of errors, as when stopping on a designated line. For fifteen drivers the correlations between the measurements of two examiners varied from zero for a few items to .85 for time required for parking. When the fifteen most reliable items were combined as a battery, the total score on this battery yielded a reliability coefficient between the examiners of .54. Hence, this lead has been abandoned as probably not worth the extra effort.

The reliability of the general ratings on the road test has been computed by correlating two series of ratings of 127 men made on the same day by several examiners. This procedure yielded a co-

* A recent analysis of variance of the ratings of three examiners (a total of 147 ratings) disclosed a highly significant difference among the examiners.

efficient of .72. It should be emphasized that in this study the examiners received special training in rating the drivers. Ratings are not expected to yield such reliability coefficients under ordinary conditions. The fact that the ratings show a higher reliability than the quantitative measurements may be due to: (1) the simple summing of the measurements (even though weighted) as compared with the examiner's ability to construct patterns of his observations and (2) the inclusion in the general rating of some items not on the check list.

In general, the reliability coefficients for the road test are not impressive when compared to commonly used objective tests. When considered as criteria, however, the road test data are probably as reliable as those usually available for validity studies. It is likely that the reliability of the road test could be improved by proper training of the examiners.

Possible Predictors

Although the road test of driving ability can be used as a predictor as well as a criterion, it suffers from the practical disadvantages of individual tests. To explore the advantages of group tests, several of the multiple-choice type have been constructed and analyzed. Tests of driver information, containing questions about safe practices, uses of instruments, simple repairs and the like have yielded split-half reliability coefficients in the .70's and .80's. Two revisions, recently completed, are expected to show higher reliability. The multiple-choice technique has also been applied to the construction of an inventory of driving experience. In addition to the factual items about experience with various vehicles under various conditions, some items of the inventory ask for expressions of preference and self-estimates. Reliability data are not yet available.

A relation between driving ability and certain visual and motor abilities has been suspected for some time, and tests have been used by civilian organizations to weed out unsafe drivers on this basis. In the hope of adapting such tests to the Army problem of identifying potential driving skill in inexperienced men, many tests of visual functions and of sensori-motor coordinations have been studied. Before considering the evidence available in the Personnel Research Section on the validity of these psychophysical tests, it will be helpful to describe the unfamiliar ones briefly and to present some data on reliability. The conditions under which

these data were obtained were not ideal for determining the maximum accuracy of the tests, but they are probably representative of the conditions under which Army tests must work.

Visual functions, daytime conditions. Table 1 gives reliability data for some familiar tests of visual acuity. Table 2 gives some intercorrelations.

TABLE 1
RELIABILITIES OF SOME TESTS OF VISUAL ACUITY

	Method	*f*	*N*
Snellen Charts	Two forms	.84	210
"	Repeat—3 mos.	.70	30
Broken Circles	Two forms	.88	117
"	"	.90	82
Telebinocular Acuity, both eyes	Repeat—3 mos.	.24	155
" " left eye	"	.41	155
" " right eye	"	.29	155
" Depth Perception	"	.41	150
Field of Vision, angular measure	Split-half	.89	208

TABLE 2
INTERCORRELATIONS OF THREE TESTS OF VISUAL ACUITY—BOTH EYES

	r	*N*
Snellen and Broken Circles, Form 1	.49	115
" " "	.29	117
" " Form 2	.31	117
" and Telebinocular Acuity	.38	115
Telebinocular Acuity and Broken Circles, Form 1	.26	115

Visual functions, nighttime conditions simulated. The Biophotometer measures ability to see five faintly illuminated dots a few degrees out from the fixation point on a dark background after a period of light adaptation. A curve is fitted to the threshold-intensity of the dots plotted on recovery time; the scores are constants of this curve. The Hecht Adaptometer similarly measures threshold-intensities for the light-adapted eye as a function of dark-adaptation time. The stimulus light is at one side of the fixation point. Constants of the adaptation curve are used as scores. The Luckiesh-Moss Charts present test fields of varying degrees of contrast for discrimination. The ratio of the brightness-difference, *i.e.*, that between the test numbers and the ground, to the brightness of the ground decreases from 39.7% to 10.1%. In some installations, charts have been photographed and the films used with transmitted illumination. The Moving Target Test makes use of small test objects, *e.g.*, miniature soldiers,

weakly illuminated, which are moved slowly toward the subject until he can report their position. In the Hopkins Test of Night Vision, the test objects are under variable intensities of illumination, and the score is a function of voltage. Subjects are dark-adapted. The Intensity Discrimination Chart presents figures of decreasing degrees of contrast with a white background under dim illumination. Table 3 gives some reliability coefficients for these five tests and Table 4 some intercorrelations.

TABLE 3
RELIABILITIES OF SOME TESTS OF NIGHT VISION

	Method	*r*	*N*
Hecht Adaptometer	Repeat—10 days	.42	30
Biophotometer, 1st 5 minutes	"	.62	30
" last 5 minutes	"	.52	30
Intensity Discrimination Chart	"	.66	30
Luckiesh-Moss Charts, modified	Split-half, odd-even	.85	32
"	Split-half, 1st–2nd	.93	34
"	Repeat—4 days	.67	32
"	Repeat—10 days	.43	30
Moving Target Test	Split-half	.91	33
"	"	.93	34
"	Repeat—4 days	.33	32
Hopkins Test	Split-half	.82	33
"	"	.98	34
"	Repeat—4 days	.61	32
"	Repeat—11 days	.55	32
"	Repeat—13 days	.49	24
"	Repeat—27 days	.36	32

TABLE 4
INTERCORRELATIONS OF THREE TESTS OF NIGHT VISION

	r	*N*
Luckiesh-Moss Charts and Moving Target Test	.12	30
" " " Hopkins Test	.36	30
Hopkins Test and Moving Target Test	.53	30

Since accidents are often attributed to the glare of oncoming lights, several instruments have been constructed to test the ability of a driver to see letters or other test objects against a background of glaring lights. Scores can be obtained both with the glare and without. The Snellen Letters have been set up under weak illumination with a glaring light at one side. Those who can read the letters closest to the glare get the highest scores. The American Automotive Association Glare Test also uses letters. The DeSilva apparatus measures the time required for reporting the inclination of a bar after the glaring lights have been turned

off. Some reliability coefficients obtained from several Army investigations are reported in Table 5.

TABLE 5
RELIABILITIES OF TESTS OF GLARE RESISTANCE

	Method	*r*	*N*
Snellen Letters with opposing glare	Split-half	.88	208
Snellen Letters under weak illumination without glare	"	.90	208
AAA Glare Test	Repeat—10 days	.75	30
" " " without glare	"	.64	30
DeSilva Glarometer, resistance to glare	"	.32	30
" " recovery from glare	"	.36	30

It is an important question whether these laboratory tests can be used as measures of night vision under actual Army conditions, as in driving during a blackout. To answer this question a road test of night vision was set up. Test objects of cardboard, one foot square, were placed along a road on both sides. The subject, riding beside a driver, was required to press an appropriate button as soon as he saw a card on either side. The score is in terms of distance. For 27 men given two trials the split-half reliability was .77. Correlations of several laboratory tests with this road test for night vision are given in Table 6. There were about thirty cases in these samples.

TABLE 6
CORRELATIONS WITH ROAD TEST FOR NIGHT VISION

AAA Glare Test, with Glare	.03
Intensity Discrimination Charts	.15
Hecht Adaptometer	.18
DeSilva Glarometer, Resistance	.19
" " Recovery Time	.25
AAA Test, without glare	.25
Snellen Charts	.28
Biophotometer, 1st 5 minutes	.28
" last 5 minutes	.40
Luckiesh-Moss Charts	.37
Moving Target Test	.54
Hopkins Test	.55
Multiple correlation of last three	.66

Night vision in respect to race and sugar intake. It is pertinent to mention at this point some incidental evidence on night vision which has general interest. Dr. Selig Hecht, being concerned with race differences in night vision, secured scores of night vision for 119 white and 71 colored soldiers and submitted them to the Personnel Research Section. The mean score for the white soldiers

was a trifle better than the mean score for the colored soldiers. The critical ratio of the difference was 0.8. A similar study was carried out with the Wald Adaptometer. This instrument measures sensitivity to faint intensities of illumination after dark adaptation. The scores are units on a rheostat which have practically a logarithmic relation to stimulus-intensity. Hence the scores are only slightly skewed and are suitable for most statistical purposes. Scores for 921 white and 51 colored soldiers were compared and yielded a small difference in favor of the white sample. The critical ratio here was 1.7.

The effect on night vision of a high sugar intake has occasioned some discussion recently. To check on this possibility 450 of the above sample were given a highly concentrated sugar solution (Red Label Karo Syrup, unsweetened grapefruit juice, and water) 30 minutes before being tested on the Wald Adaptometer. This experiment yielded a negligible difference in favor of those with

TABLE 7
RELIABILITIES OF TESTS OF SENSORI-MOTOR COORDINATIONS

	Method	*r*	*N*
Simple braking time	Split-half	.89	117
Accelerator reaction time	"	.84	117
Vigilance braking time	"	.61	117
Accelerator reaction time	Repeat—2 mos.	.41	155
Simple steering	"	.30	154
Vigilance braking	"	.09	155
Vigilance steering	"	.34	151
Simple reaction time	Split-half	.92	208
Steadiness	"	.73	208
Simple foot reaction	"	.68	208
False reactions	"	.44	208

sugar. All the distributions from the above samples were continuous, showing no evidence for the existence of a special night-blind group.

Sensori-motor coordinations. The data reported for the smaller samples in Table 7 were obtained from a Driving-Vigilance Apparatus, designed by DeSilva and described by him in *Why We Have Automobile Accidents* (1). It is a dummy motor vehicle in which the driver sees a miniature moving road scene requiring him to steer, to brake, and to do both simultaneously. For the larger sample, the Steadiness Test is the familiar stylus to be moved between two plates. The score is the distance covered before con-

tact. In the Simple Foot Reaction, seven reactions were made; the score is the number of reactions longer than 0.6 seconds. False Reactions noted in the table refers to the number of false reactions to a distracting light in seven trials.

Validity of the Predictors

The validity of the road test as a predictor has not been investigated extensively because of its disadvantages as a practical selection device. It is worth mentioning here, however, that in a validation study on 156 selectees with a battery which included eight psychophysical tests and five items of personal data the road test was the best predictor ($r = .53$) of rating on a second road test three months later.

Many personal items, such as age, weight, driving experience, and possession of a license, which can be reported by the soldier, have been tried out in several validation studies on various samples. Since the most promising of these items have been included in the Driver Experience Inventory, the validities of these items need not be considered separately. For validation of the Driver Experience Inventory, the Personnel Research Section secured the cooperation of several Army and civilian transportation organizations in rating their drivers. A sample of 222 drivers was thus obtained: 87 rated "good" and 135 rated "poor." Since the items on an inventory of this nature are not factual, three methods of scoring the alternatives were used. Biserial correlations with the criterion ratings were .69, .75, and .81. These coefficients are presumably inflated by the method used for obtaining the criterion groups. In a more recent study of 282 drivers, with a revised form, the Pearson correlation with the five-step road test ratings was only .26. The difference between these coefficients is largely due to the difference between examiners in the ratings given. When the second sample was broken down and correlations computed within small groups rated by one examiner, the coefficients were .67, .51, .41, .09, .61. Obviously the variation between raters and that introduced by combining ratings made according to heterogeneous criteria make the problem of validation very difficult.

The problems in validating the Driver Information Test are similar to those involved in the Driver Experience Inventory. The validity coefficients likewise are of the same order. The General

Classification Test and the Mechanical Aptitude Test have shown low and zero correlations with ratings of driving skill in various samples. These figures are important in a negative way since men scoring high on these two tests are in demand for other assignments.

Attempts at validation of the psychophysical tests have not been encouraging. One early study used a sorting procedure based on biserial correlations of the predictors with the road test. Ratings on a four-point scale were available on 952 men, of whom 34.9% were rated "poor." Sorting out drivers with less than six months' experience, those with an annual mileage of less than 500, and those never licensed left 633 drivers, of whom 16.7% were in the "poor" category, and correspondingly larger percentages in the three higher categories. Such selection is apparently advantageous. A second sorting eliminated from the 633 drivers those ranking poorest on reaction time, simple steering, vigilance braking, and vigilance steering. This left 587 men, of whom 15.7% were in the "poor" category. Selection on the basis of the psychophysical tests, therefore, produced an improvement in the quality of the drivers too small for practical purposes. In one validation study with 128 men, in which the ratings were demonstrated to be reasonably reliable, biserial correlations for ten psychophysical tests ranged between .00 and .26. In a large-scale study with 1,928 men, the highest correlation of any of five psychophysical tests with the road test was .17.

In general, data from all experiments with the psychophysical tests show low positive and zero correlations and some inconsistency from sample to sample in the correlations between a predictor and the road test. This inconsistency, of some interest in itself, may be due to (1) large sampling errors associated with small populations, (2) the difficulty of establishing and maintaining in the Army conditions sufficiently stable for the more refined psychophysical tests, and (3) variations in the ratings used as criteria. A further important point, in connection with the psychophysical tests in particular, is that the soldiers are a select population with respect to physical functions. They are relatively young and those with more obvious types of physical defects have been eliminated. The negative findings in these studies of an Army population may possibly not apply to a civilian population —or to an Army population less rigidly selected.

Summary

The criterion used in most Army research on the selection of truck drivers has been a road test of driving skill. Under optimum conditions the road test has shown a fair degree of reliability; under more usual conditions the reliability may be low. The predictors used have been the road test itself, multiple-choice tests of driver information and experience, and various tests of visual and sensori-motor functions, such as visual acuity, night vision, and reaction time. The road test is not practicable, since it is an individual test which requires experienced examiners, expensive equipment and a testing period of about twenty minutes per man. The Driver Information Test and the Driver Experience Inventory have the advantages of group tests. They have shown promise in experimental studies, but complete data are not yet available. Some of the psychophysical tests studied have shown high split-half reliabilities, but most of the repeat reliabilities are low. Validity data for them have been disappointing. Probable reasons for the low validity coefficients have been discussed. Because of the low validities and the difficulties of administration of these psychophysical tests under Army conditions, their routine use for selection purposes is not considered advisable.

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PERSONNEL SELECTION AT AN ENGINEER REPLACEMENT TRAINING CENTER

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The purpose of this paper is to discuss some of the problems relating to personnel selection at an Engineer Replacement Training Center, to describe the present methods of solving them, and to mention studies toward more effective methods.

I. The Problems of Selection

The military mission, as of November, 1942, of the Center under discussion is realized through the following courses:

1. A twelve weeks' comprehensive course in basic and general military engineering subjects. The graduates of this course are prepared to go either to field units as replacements or to Officer Candidate Schools as student officers, depending on their qualifications.
2. A five weeks' less comprehensive course in basic and general military engineering subjects. The graduates of this course are usually enrolled in specialist courses, either in the Center, in military schools elsewhere, or in civilian schools. In these schools they are trained from five to twelve weeks in such specialties as auto mechanics, welding, geodetic computing, and surveying. After completion of these courses, the men are transferred to field units as replacements, or to more advanced schools.
3. An eight weeks' course in elementary education, plus military and engineering subjects. Men are prepared for one of the following dispositions: (a) transfer to either the five weeks' or twelve weeks' training course, provided improvement is sufficient to indicate prerequisite qualifications; (b) transfer out of the Center to restricted assignments, for those who have physical handicaps disqualifying them for full field duty but not severe enough to preclude some usefulness to the Service; or (c) discharge from the Army because of physical, mental, or emotional handicaps which preclude usefulness to the Service.
4. Several courses in military specialties, of five to seven weeks.

In other words, the problem of selection resolves itself into selecting men for: (a) Officer Candidate Schools, (b) specialist schools, (c) basic engineer soldiering, and (d) elimination from the service. The problem is greatly complicated, however, by many practical necessities. Among these are: the large number of men to be processed; the restricted time available; the many other

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matters with which the selection must be coordinated, such as issue of supplies and equipment, medical processing, train schedules, training requirements, available housing and training facilities; sudden changes, with little or no notice, of the quotas of men to be furnished in various categories; the unavailability at the time needed of tentatively selected men because of sickness, confinement, quarantine, or higher priority needs; the preparation of many of the classification reports, involving evaluation and judgment, by personnel who have had insufficient experience in selection; and the continuous turnover of trainer, administrative, and selection personnel dictated by the necessity of furnishing experienced personnel to new and expanding organizations.

II. The Selection Procedures

An effort is made to minimize the detrimental influence of the above-mentioned problems by making selection a continuous process, closely coordinated with the training program, becoming more refined as required by the successive stage of training and as facilitated by more pertinent data accumulated during the training. This procedure has the following advantages:

1. The initial selections can be made by relatively new and untrained personnel, thus reserving the trained and more efficient personnel for the more refined and specialized problems of selection.
2. Each stage in the selection program can be handled in a minimum of time.
3. Readjustments can be made at various stages of the training program, in the light of information accumulated about the men during their training.

Assignments to the Branches of the Service. This highly continuous process of selection begins at the Reception Centers, where men stay for a few days after induction into the Army, and extends through the entire career of each soldier. One of the functions of the Reception Centers is to assure that men are assigned to the branch of the Service in which they can be of most value. In addition, they record on a permanent record, the Soldier's Qualification Card, information of permanent value which will be helpful later in more refined selection and assignment. This information includes, among other things, such data as formal education, major school subject, main and second best civilian occupations, facility in foreign languages, previous military experiences, hobbies, sports, talents for furnishing entertainment, recom-

mended military assignment, and the results of various standardized tests. These tests include measures of general ability as well as aptitudes in specific fields. This information, with the exception of test results, is obtained in interviews with the soldiers. The validity of certain statements of occupational experiences may be checked, at the discretion of the interviewer, by means of oral trade questions.

The information, just outlined, is the basis for assigning men to the various branches of the Service. Consequently, the men who arrive at the Engineer Replacement Training Center are selected for it because their qualifications seem to indicate that they could be of as much or more value in the Corps of Engineers as in the Infantry, Field Artillery, Air Forces, or any other branch.

Preliminary Assignments Within the Center. As soon as the men arrive at the Engineer Replacement Training Center, another selection is immediately accomplished. This must be achieved in a very short time, since it must precede assignments to training units, quarters, and beds, and the allotment of rations. The selection of 500 men requires about one hour and can be achieved from information on the Qualification Cards. The selection is based on the following criteria:

1. Scores on the general ability test, called the Army General Classification Test, and with norms designed to assign grades I, II, III, IV and V to 7%, 24%, 38%, 24% and 7% respectively—grade I being the highest.
2. Formal education.
3. Main and second best civilian occupations.

The newly-arrived men are placed in one of the following training units according to their qualifications:

1. *Potential officer candidate training units:*
   a. Grade I on the AGCT (Army General Classification Test).
   b. Grade II on the AGCT and high school graduation.
2. *Non-specialist training units*
   a. Grade V on the AGCT.
   b. Grade IV on the AGCT and less than grade school graduation.
3. *Specialist training units:*
   a. Civilian occupations equivalent, or closely related, to military specialist training to be given, and not having qualifications mentioned in "1" or "2" above.
4. *Pre-specialist training units:*
   a. Grade II on the AGCT and less than high school graduation.
   b. Grade III on the AGCT.

c. Grade IV on the AGCT and grade school graduation, all three of these only if not included in "3" above.

Both "3" and "4" above are pre-specialist training units for the first five weeks. The only difference is that men in unit "3" go from pre-specialist training into specialist training; while the men of "4" are, in general, prepared for transfer out to specialist schools elsewhere.

These differential assignments have the following advantages:

1. They provide for adoption of the training program to the ability of the men.

2. They restrict the type of administrative problems with which the officers and enlisted instructors of each unit have to be concerned.

3. The men of each unit, tentatively scheduled for a particular class of future training, can be further studied as to their qualifications, and reassignment can be more effectively accomplished.

Reassignment Due to Health Deficiencies. Concrete steps toward reassignment are initiated during the first two days of training. During this period, each platoon leader interviews his men in an effort to discover any physical defects which may not yet have been noticed. Men found to have physical defects are routed through the appropriate channels to the various medical and other facilities available. They include:

1. Medical treatment at the dispensary.

2. Referral to a specialist at the station hospital.

3. Referral to the Consultation Service of the Center Headquarters. This latter corresponds closely to a mental hygiene team in civilian life, and includes on its staff a psychiatric officer, a psychological officer, a trained psychiatric social worker, and selected enlisted personnel with the most appropriate educational and experiential backgrounds locally available.

4. Transfer to the physical section of the elementary training unit. This section provides for those who are unable to carry on regular training reasonably well without undue danger to themselves or others because of some physical limitations inappropriate for hospitalization, yet not remedial within ten days.

The findings accumulated in the above procedures are entered on a medical record and are transferred later to the Qualification Card where they are available in making future assignments. Each man on whom a medical record is initiated is classified for one of the following dispositions:

1. Discharged for limitations.

2. Limited service, which restricts the man's assignment to occupations compatible with his limitations.

3. Full field duty.

Reassignments of the Retarded. While the above described measures appropriate to health deficiencies are being taken, other measures toward appropriate classification, reassignment and training of those markedly deficient in mentality, education, motor coordination and socio-psychological adjustment are being made. Particular attention is directed to isolating these individuals during the first two weeks of training. Each platoon commander is requested to be on the alert for men with any of the following characteristics: (a) inability to read a letter; (b) inability to write a letter; (c) crying; (d) unusual temper outbursts; (e) alcoholism; (f) chronic complaining; (g) continuously in difficulties; (h) "undesirable" habits and traits of character; (i) lack of adaptability to the Service; (j) continuously "riding" the sick book; (k) extremely nervous in certain training situations, such as firing, or demolition training; and (l) marked deficiencies in various aspects of the training, even after individual training and attention.

In addition, the platoon commanders are given the names of all men who made grade V on the Army General Classification Test. They are requested to observe all retarded men carefully so as to arrive at a decision as to whom to recommend for special development training. They are asked to recommend: (a) all men whom they feel will be of greater usefulness after special development training, and (b) all whom they feel cannot be of use unless they are improved by such training. The specific reasons for the recommendation are stated in each case. Those recommended are tested, interviewed, and observed in the execution of basic drill by a psychological officer who considers the following points in his evaluation of each man: (a) occupational history, (b) educational history, (c) pre-army social adjustment, (d) economical achievements, (e) motor coordination, (f) test results, and (g) army adjustment.

The following dispositions of the individuals are available to the psychological officer:

1. Return to regular training.
2. Referral to the psychiatric officer.
3. Transfer to a special development training unit.
4. Therapeutic suggestions to the individual or his company officers, or both.

Those returned to regular training are, in general, given no further attention by the psychological officer unless additional requests are made by the company officers. Those referred to the psychiatric officer are examined more completely. This includes at least one or more interviews by the psychiatrist, and may include the preparation of a case history by the Red Cross social psychiatric worker, a comprehensive medical study, and a therapeutic program. During the investigation, the soldier may be hospitalized, retained in regular training, or transferred to special development training. Those who are transferred to special development training are carefully observed by their new platoon commanders. On the basis of their observations, and reports from the medical, psychiatric, and psychological officers, the platoon commanders make recommendations for one of the following dispositions:

1. Discharge for limitations.
2. Classification as limited service and transfer out of the Replacement Training Center.
3. Return to regular training for completion of that course.

These recommendations in conjunction with the records on the individuals are reviewed by the psychological officer. Additional studies of the individuals are completed if deemed essential to a competent solution. The recommendations are approved or readjusted, and appropriate action then follows.

Reassignments to Training Units. While appropriate attention is directed to solve the problems of limitations in health, education, mentality, motor-coordination, and socio-psychological adjustments, other procedures are under way to secure additional information which will assist in making reassignments, at the end of five weeks, of potential officer candidates, specialists and nonspecialists, and to facilitate assignment to particular specialist schools.

The first step in the reassignment to training units requires that each trainee complete a questionnaire on education, experience, and interest, as related to each of the many specialties for which men are selected.

The questionnaire includes high-school, trade-school, and college subjects which are closely related to any of the specialties for which trainees are selected, and requires the trainees to indicate how many years in each school he studied the subjects, together with a statement of his grades

as below average, average, or above average. In addition, the questionnaire contains five to ten occupational questions pertinent to each specialty. These are designed to determine how much occupational experience each trainee has had in that or related specialties. The last section of the questionnaire lists all the many specialties and requires the trainees to indicate their first ten preferences.

The information from the questionnaire, the Qualification Card, and the test scores is supplemented by reports from the platoon commanders, who have vigorously trained the men for four weeks. The preparation of this report by platoon commanders is facilitated by the fact that the trainees during the training are in three groups—potential officer candidates, potential specialists, and potential non-specialists. The platoon commanders report the names of those whom they think should be reassigned, with the specific reasons in each case. The recommendations usually include reassignments between potential officer candidates and potential specialists, and between potential non-specialists and potential specialists. Most of the recommended changes represent borderline cases, and often the number needed determines the final disposition. An additional report is required from the platoon commanders in the case of all trainees who obtained grade II or better on the Army General Classification Test. This is in the form of leadership ratings of potential officer candidates and utilizes Thurstone's paired comparison method, whereby each trainee is compared, on the quality under consideration, with every other trainee.

The first step in selecting specific individuals concerns itself with the potential officer candidates. The number of possible candidates is reduced at this time, and some are reclassified as potential specialists. The number eliminated at this time depends on the estimated number of officer candidates who are to be furnished from the group after they have completed an additional seven weeks of training. An effort is made to retain at least twice the number needed. This is not always possible because of the heavy demands for both officer candidates and specialists. Those held are in general the ones with the higher leadership ratings. All college graduates in engineering are held, regardless of their leadership ratings. Those individuals who are not high-school graduates must rate as high or higher on leadership than the average of the others retained, who have more education. In

general those are not held whom the platoon commanders have specifically recommended as potential specialists rather than potential officer candidates.

Selections for Specialist Courses. The next step is to consider the records of all the potential specialists and assign them to specific specialist courses. The method for this selection is to provide a "pigeon hole" for each one of the thirty or more specialist courses, representing a reasonably wide range and variety of specialties. All of the records for twelve hundred men are gone over one by one to select men for from 1050 up to 1200 assignments. After study, each record is placed in that one "pigeon hole" which seems to represent the course for which the individual is best fitted. This method leads to a discrepancy, which is readjusted, between the number tentatively assigned to each course and the quota for that course. Wherever there are overages, the records are again carefully analyzed and a sufficient number of the least well qualified are withdrawn so as to make the assignments equal the quotas. Those withdrawn are used to fill the courses where there were shortages. The individuals not assigned, if any, are retained for training as non-specialists; that is, they take seven more weeks' training as basic engineer soldiers and then are transferred to field units as non-specialist replacements. At their new units they may compete for specialist school assignments and non-commissioned officer grades. The following principles are applied in making the selections:

1. Valid evidence of successful experience in a specialty, or in a closely related one, is the best single indication of suitability for that specialty.
2. Interest is a highly significant factor only if based on experience in the specialty, or at least detailed knowledge of it.
3. Interest cannot compensate for insufficient aptitude.
4. Courses in closely related school subjects with good grades, or with better grades than in other subjects, are valid evidences of suitability for a specialty.
5. Closely related hobbies, if conscientiously and continuously followed over a period of years, are valid evidences of suitability for a specialty.
6. Other things equal, individuals should be selected for those specialties which utilize the most of their abilities and aptitudes.
7. The shorter training courses should receive the better qualified men, provided other considerations are equal.
8. The minimum educational background requirement for each specialty should be met.
9. Borderline cases should be selected only when the school quotas cannot be met without them.

After the selections are made, the school assignments are published in orders. Prior to this time the platoon commanders have been informed concerning many of the problems and principles involved in the selections. The platoon commanders are thus able to answer inquiries which the men have about their assignments. Also they are able to judge between mistaken assignments and lack of appreciation on the part of the men as to the principles involved. The suspected misassignments can be reported for reconsideration. The men lacking appreciation of the principles and problems of selection can usually be enlightened and convinced of the wisdom of the assignments. Records of the data accumulated are kept on all the men, and evidences of achievement in the specialty assignments are obtained from some of the schools and serve as a basis for follow-up studies designed to improve selection. For those relatively few individuals who attend specialist schools at the Center, provisions are made for reassignment. Any instructor who feels that a reassignment is appropriate may recommend it to the assignment officer, together with the reasons. The assignment officer studies the case and takes the action deemed by him to be appropriate.

Selections for Officer Candidate Schools. Mention has been made of how certain potential officer candidates are reclassified at the end of five weeks of training, on the basis of leadership ratings and education, and are assigned to specialist schools. Those who remain as potential officer candidates are continually studied. Their platoon commanders try them out in leadership assignments so as to obtain more valid estimates. Their comparative leadership ratings are posted on the bulletin boards so as to create greater competition. The last civilian school they attended is requested to furnish their relative grade standing in the highest grade completed, together with a statement of the number of students in the class. All the information available on each man, including that customarily available on men selected for specialist schools, is furnished a board of officers which is charged with selecting the best qualified applicants. This board first meets during the ninth week of training, carefully studies all the information and interviews each applicant. The interviews cover such information as positions of civilian and military leadership, social adjustment, education, occupation, hobbies, and general knowledge. Each applicant is tentatively approved or disapproved. These tentative decisions are furnished to the company officers and the applicants.

The company officers are requested to make recommendations for reconsideration during the twelfth and last week of the training course. This method of reconsideration is based on the assumption that the company officers, who train the men, are in a more favorable position to judge their qualities. The break between approval-disapproval as set by the board furnishes them the standard and enables them to recommend interchanges which make the break more clear-cut. Further study of the cases recommended for reconsideration usually leads the board members to accept the recommendations of the company officers. The finally disapproved cases are transferred out to field units at the completion of their training at the Center. Here they may continue to compete for officer candidacy, specialist schools, and noncommissioned-officer grades.

Qualification records are kept on those who are transferred to the Officer Candidate School, and achievement records are obtained from the School. These are compared and studied in an effort to improve selection. A recent study divided those transferred to the Officer Candidate School into the following three categories, according to their most advanced civilian school graduations: (a) college, (b) high-school, and (c) grade school. The high-school graduates were found to have the greatest percentage of failures. They probably exceeded the grade-school graduates, because the grade-school graduates were required to have higher leadership ratings in order to be considered for the School. Consequently, the minimum leadership rating for high-school graduates was increased.

III. Summary and Conclusions

This paper briefly outlines the mission of an Engineer Replacement Training Center and describes the various techniques, methods, and principles applied in selecting men for the various courses and schools. It shows the great influence of psychology in one sphere of building an army. It illustrates how psychological techniques, methods, and theories can be applied in practical ways, replacing long established, less scientific approaches. These accomplishments seem to indicate that applied psychology is destined to have a great expansion in future peaceful reconstruction and achievements.

PROFESSIONAL SERVICES AND TRAINING REQUIREMENTS OF THE PSYCHOLOGIST IN CLASS H-V (S) OF THE NAVY[1]

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I. Psychological Services in the Navy

The United States Navy has long shown interest in the contributions of psychologists to the solutions of numerous naval problems. This fact has been indicated earlier by Jenkins (7) and Louttit (16, 17). It, too, has been recently demonstrated by two surveys (28) in which the names and military assignments of psychologists in the various branches of the armed services are reported. In line with these and other pertinent discussions the present paper has been prepared. Its aim is twofold. First, it is proposed to discuss, within the limits of military secrecy, the nature and the duties of one group of psychologists within the United States Naval Reserve. In this way the Psychologist in civilian life can become still more familiar with the practical ends to which psychological training can be directed. Second, and a corollary of the first, the following paragraphs may provide psychologists in colleges and universities with a knowledge of the skills most useful in one arm of the Naval Reserve. These facts, taken in conjunction with those already offered by those in the Navy (7, 12, 16, 17) and those now available from the Army (3, 4, 9, 22, 23, 31), should serve to aid in the orientation of psychological training programs (1, 6, 18) in universities toward the facilitation of the war effort.

The military psychologist within the United States Navy is ordinarily assigned by virtue of the specialized nature of his training and experience to one of the following three arms of the service.

First, he may be ordered to active duty in the aviation branch of the Naval Reserve. When this is the case he assists in the selection and placement of men for flight training. Whatever the specific nature of these duties (7, 16, 17), however, the psychologist functions in a technical and advisory capacity to flight officers, flight instructors, and flight physi-

[1] The opinions and assertions contained in this paper are those of the authors and are not to be construed as official or as reflecting the views of the Navy Department or the naval service at large.

cians. For the sake of easy designation this psychologist, along with other specialists of service in aviation medicine, is termed an Aviation Volunteer Specialist. This characterization is frequently abbreviated the A-V (S) division of the Naval Reserve.

Second, the psychologist may be assigned to duties within D-V (S). He, as a commissioned Deck Officer Volunteer Specialist, is charged with the development and advancement of personnel programs underway at naval bases and stations. His duties are chiefly those of a personnel officer who aids in examining, selecting and placing trainees, following their basic military ("boot") training, in special service schools for advanced training. He, accordingly, materially helps in designating the men likely to profit most rapidly from specialized training in those skills needed at shore stations and on ship board. The Deck Officer Specialist consequently develops and administers general educational achievement and specialized aptitude tests in order to provide the Navy with a continuous and ever adequate supply of trained personnel. In the effective execution of these assignments the psychologist must be experienced in the use of interview techniques, the administration of achievement (arithmetic, English, and spelling, to illustrate) examinations, and in the interpretation of scores earned on aptitude tests (mechanical and clerical, for example). He, too, must be familiar with general-intelligence tests; and able to administer and interpret them. By means of these techniques the psychologist, as a naval personnel officer, assists in making the most appropriate assignment of each man, upon the latter's graduation from "boot" training, to that arm of naval service most warranted in terms of the man's abilities, past achievements, aptitudes, and interests.

Third, he may be appointed to serve as a Hospital Volunteer Specialist. When thus commissioned he is assigned, in abbreviated designation, to Class H-V (S)[2] and to serve in connection with duties within the Medical Corps. While numerous psychologists within this category are ordered to duties in naval aviation,[3] others are directed to assist in the examination and selection of recruits at naval stations that have been specifically established to provide basic military training for recruits upon their entrance to the service. These psychologists accordingly assist the medical officer in the initial selection of trainees who enlist or who are inducted by way of Selective Service channels. It is to a detailed description of the duties of the psychologist as a specialist in Class H-V (S) at a naval training station that attention is now turned.

II. Psychological Services in Class H-V (S) at Great Lakes

Prominent among the activities of the psychologist in H-V (S) is his close professional relationship with the psychiatrist and

[2] This psychologist is a staff officer in contradistinction to the psychologist in D-V (S) who is a line officer.

[3] The research duties of certain psychologists in any one of these three categories are not discussed in this, a general consideration of divisional functions.

other members of the medical profession. Indeed, clinical psychology and psychiatry function concurrently at The Great Lakes Naval Training Station in a joint attempt to eliminate at the outset recruits who are basically inapt and unfit for naval service. Shortly after their arrival at the shore station, the recruits are subject to a summary psychiatric interview which is held in conjunction with the routine physical examination. The purpose of this interview is to detect the existence of neurologic, psychiatric, and psychologic defects that would serve to hinder the recruit's subsequent adjustment to naval regimens. When such defects are observed, the recruit is detained and then transferred to an observation ward for additional study.

During the preliminary examination it is frequently found necessary to conduct brief psychometric examinations to determine the existence of subnormal intellectual development. For the purpose of arriving at a rough approximation of mental abilities, the Kent *Oral Emergency Test* (**8**) has been found of value. This test, requiring from eight to ten minutes to administer, has been shown appropriate for the examination of naval personnel (**10**), and has been demonstrated to correlate surprisingly well with more detailed and precise tests of intelligence (**2**, **5**, **11**, **25**). No final diagnosis of mental deficiency, however, is made on the basis of this test alone. Recruits receiving suspiciously low scores are reexamined with more extensive psychometry during the period of their observation.

In addition, the existence of illiteracy is customarily discovered during the preliminary psychiatric examination already mentioned. The Navy sets forth no specific educational requirements for enlistment; however general provisions in this regard are to be found in paragraph 1404 (a) of *The Manual of the Medical Department of the United States Navy* (**30**):

> No educational standard has been officially established for recruits presenting themselves for enlistment in the naval service. The regulations require, however, that a candidate shall be able to read and write and that he should possess reasonably quick and clear understanding.

Thus, while no generally accepted criteria of illiteracy exist, it has been found profitable and practical at this station to measure reading ability for naval services by testing the recruit with selected passages from the *Bluejacket's Manual* (**29**). This manual, issued routinely to each recruit during his initial period of training, is a volume containing instructions and general information per-

taining to Navy life and training. It accordingly contains material that the recruit may normally be expected to read during his naval career. More detailed discussions of the problem of illiteracy and its measurement are found elsewhere (**12, 13**).

Recruits held over for further study because of suspected psychiatric or psychologic disabilities are barracked in an observation ward where thorough psychiatric and psychological examinations are conducted for the purpose of determining the exact nature of the existing disability. In this ward, known as the Neuropsychiatric Unit, psychiatrists and psychologists collaborate in attempting to differentiate between those recruits whose defects render them unfit for military service and those whose defects are minor and would not preclude satisfactory military adjustment. It is well to note that while recruits are placed in the observation ward because of specific psychiatric and psychologic disabilities, it is frequently found that cross references between psychologists and psychiatrists are necessary in arriving at a final disposition.

Because of the national emergency, psychometry in the Navy must necessarily be expeditious. Involved and time-consuming tests, while frequently of value, generally are not practicable when large numbers of persons must be examined in relatively limited periods of time.

The *Bellevue-Wechsler Adult Intelligence Scale* (**26**) has been found acceptable as a testing instrument at this station since its administration is not too prolonged and inasmuch as it has been standardized for use with adults rather than exclusively for children and adolescents. Because of its content, it appeals even to the more mature recruit. The fact that half of the items are nonverbal permits these tests to be used in the examination of individuals with language disability. Further, the interpretation of the psychometric pattern by the psychologist is often of marked value to the psychiatrist in his arrival at a differential diagnosis. Evidence that relatively consistent psychometric patterns exist among patients with certain types of psychiatric and neurologic disabilities has recently been advanced (**20, 21**). The discriminative value of the various subtests of the examination among subnormal intellectual groups of both civilian and military status has likewise been determined (**14, 15, 27**).

Recruits temporarily held under observation in the Neuropsychiatric Unit may be dealt with in one of several ways. If found normal, they are sent to duty and their cases are then closed. If they exhibit disabilities of a minor nature, they are sent to "trial duty" with their company for a period of two or three

weeks after which time they report to the Unit for re-examination. If they are progressing normally and show no signs of maladjustment, they are returned to duty and their cases are closed. If found to be adjusting poorly, as evidenced by their Company Commander's report, they are readmitted to the observation ward for further study and other disposition. Those recruits found to be suffering from severe neuropsychiatric disorder are hospitalized, while those adjudged unfit for naval service in the opinion of the examining psychologists and psychiatrists are discharged from the service by special order. The special order discharge is recommended only after the case has been reviewed by the Aptitude Board.

The Aptitude Board, convened by virtue of military directive, consists of one line officer, one medical officer of the regular Navy, two psychiatrists, and one psychologist. The purpose of this board is to review the findings of the psychiatrists and psychologists and to make recommendations concerning the recruit's discharge by special order. Because of the heterogeneous composition of the Board, several viewpoints are represented and thus practical and appropriate action on each case is possible.

Psychologists and psychiatrists of the Neuropsychiatric Unit are concerned not only with recruits referred during their preliminary examination, but also with those recruits whose difficulties developed or were first revealed during their period of "boot" training. Such recruits are referred from several sources, including dispensaries, company commanders, and service schools.

The examination of prisoners referred by the Discipline Office is also a function of the Unit. Men referred from sources other than the preliminary examination are dealt with in the same manner described above. Final action in each case is likewise taken by the Aptitude Board.

The psychological services recounted in the foregoing paragraphs are those rendered in conjunction with the Neuropsychiatric Unit at this training station. Variations in policy are doubtless to be found at other shore stations. It is safe to generalize, however, that coordination of medical, psychiatric, and psychological procedures is an effective policy in the elimination of those recruits who would be unable to withstand the stress and strain of military life due to existing or potential neuropsychiatric conditions and intellectual deficiencies.

III. Professional Training Needs of the Military Psychologist in Class H-V (S) at the Shore Station

The preceding descriptive analysis of the duties performed by the psychologist in Class H-V (S) of the Navy leads directly to a consideration of the optimal training necessary for successful performance in this field of wartime endeavor. Although differences of opinion might exist on the exactness of any statement offered below, it is the opinion of the writers that the following specialized disciplines are of such paramount value that training in them is well nigh essential.

First, the psychologist, assisting in neuropsychiatric examinations, should be well trained in the field of experimental psychology and in, perhaps, one or more laboratory sciences. The major reason for the inclusion of such an emphasis lies in the fact that in this way the psychologist becomes familiar at firsthand with the scientific method. He is able consequently to discriminate between fact and fiction. He is able to recognize variables and to avoid errors in formulating cause and effect relationships. The skilled utilization of the scientific method provides the psychologist with a tool that implements his use of the raw data obtained in his clinical interviews.

Second, the psychologist who performs the functions described above, must be familiar in a very real and basic sense with the fundamentals of general and abnormal psychology. Although he never serves as a psychiatrist, the more knowledge he possesses the greater his contribution to the resolution of many medical problems arising during recruit "mental" examinations. To correlate these two functions, the psychologic and the neuropsychiatric, the aforementioned method of cross-consultation is an integral part of the local Unit. A knowledge of what is known about normal-abnormal behavior patterns and particularly of the numerous syndromes commonly encountered in the broad field of psychopathology is absolutely essential.

Third, the military psychologist advisedly should be equipped with a general knowledge of clinical psychology and a very specialized knowledge of, and skill in, mental measurements. He, for example, must know the most effective means for the rapid collection and recording of clinical data in the preparation of the case history. He needs skill in the discrimination of the immediately relevant from the remotely pertinent. He should be able to administer tests of general and special intelligence. He, in addition, should be able to interpret each man's performance scores. Training in the use of the scientific method is here of decided value.

Fourth, the psychologist in Class H-V (S) does well to be familiar with the sciences of physiology and neurology. Even a cursory familiarity with the structure and functions of the human central nervous system cannot come amiss. The more detailed this knowledge of the neurological basis

of human behavior, the more successful, other factors being equal, will be the psychologist's efforts in dealing with organic cases. Finally, the ready availability of the skillful use of the interview technique cannot be underestimated as a valuable asset.

Thus, in summary, experimental, abnormal, and clinical psychology contribute in a very material sense to military psychology and psychiatry as employed in the Navy's training stations. In addition, knowledge of the neurological and psychophysiological basis of behavior and the adept use of the interviewing technique add pertinent skills to these fields of specialization.

For those psychologists located in colleges and universities and for those who are faced with the readjustment of departmental offerings during wartime the following suggestions may prove of value. In the preliminary and advanced training of the young psychologist interested in the United States Naval Reserve emphasis should advisedly be placed upon the fields mentioned below. The "major" in psychology should be required to obtain training in Experimental, Abnormal, Clinical, and Personnel Psychology (1). He should acquire the skills pertinent to the administration of group and individual tests of intelligence; to learn the mechanics of interviewing; to master the rudiments of statistics sufficiently well to comprehend the meaning, and to use the methods for the determination of the validity and reliability of testing devices. Training in psychophysiology and neurology also should be made to supplement the study of Experimental, Abnormal, and Clinical branches of current psychological theory and practice. The young psychologist also might well become familiar with the problems of military leadership and discipline, the better to adapt to the military environment and its new demands upon commissioned staff and line officers. This point has been stressed previously (18, 19) and has been indirectly suggested by Smith (24). Following the mastery of these fields and their specialized techniques the graduate psychologist about to enter the military services will likely be able to adapt more rapidly to the demands made by the branch of his service.

IV. Summary

The purpose of the present paper has been to describe briefly the nature of the services rendered by psychologists in the United States Naval Reserve with special emphasis placed upon the duties of those assigned to Class H-V (S) of the Medical Depart-

ment at a shore training station. Several suggestions, the outgrowths of experience in the latter situation, have been made for the benefit of civilian psychologists actively engaged in the rearrangement of curricular offerings in colleges and universities. These descriptions and suggestions, coupled with others available from other arms of the services, may, it is hoped, help to answer often raised questions pertaining to the training needs of the military psychologist.

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COLLEGE CURRICULUM ADJUSTMENTS IN PSYCHOLOGY TO MEET WAR NEEDS

REPORT OF A COMMITTEE OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION*

It is conservatively estimated that 1500 psychologists with the M.A. or Ph.D. degree will be in the service of the Government in military or civilian capacity within 1943. An even larger number of those with more limited psychological training will be carrying responsibilities essentially psychological as personnel technicians and in related capacities. There is also need for trained psychologists outside the Government employ, for civilian services such as child care and training, industrial personnel work, and work in the schools. One responsibility of colleges and universities is to provide accelerated training to meet the immediate need for competent psychologists.

But the colleges and universities have another responsibility as well. There is unmistakable need for a well-trained citizenry, non-psychologists with sufficient understanding of themselves, of their fellow human beings, and of social behavior, to participate effectively as citizens in the solutions of the enormous problems of the war and of the post-war period. Psychology can and should be a part of a general educational program concerned with producing individuals capable of meeting successfully the problems of a democracy faced with the contemporary threats to its existence.

The different demands on psychology present different instructional problems. For convenience, three levels of instruction may be distinguished:

I. A general introductory course, intended for students who, in the vast majority of cases, will not become psychologists.

II. Special training courses for immediate service in the war effort. Most of these courses will be given in connection with the special training programs of the Army and Navy. They will be administered by the Army and Navy, but the curricula are being arranged with the advice of professional psychologists.

III. Advanced graduate work for research specialists.

It should be understood that the recommendations in this report apply only to the immediate problem put to the Committee: How can the teaching of psychology in colleges and universities be better adapted to wartime needs and conditions? Where no fundamental changes are advised, this does not imply that the present training is above criticism; but rather that no changes intended specifically to render the training more appropriate to wartime needs are recommended.

* This Committee was authorized by vote of the American Psychological Association at its 1942 meeting at the request of the U. S. Office of Education Wartime Commission. Its report is published now in advance of the 1943 meeting, at the request of the Committee and the Commission, with the hope that the report will be of value in spite of the many changes that have taken place in the colleges since the committee completed its deliberations.

I. The General Introductory Course

Major attention is given in this report to the general, introductory course, since for the majority of students it is their only formal contact with the science. Important as is the work of preparing persons for further study of psychology or for service as psychological technicians or research specialists, the more fundamental purpose is to contribute to the student's general education by helping him to a better understanding of himself, his associates, and the psychological aspects of society.

In the Committee's opinion, "defense" courses in military psychology —no matter how excellent these may be for certain purposes—should not *supplant* the basic general course. The Committee believes that this course should present fundamental concepts, principles, and methods; the fact that the country is now at war does not lessen the importance of this function of the course. At the same time, the war does emphasize the point that fundamental concepts, principles, and methods should be presented in their bearings on the problems of human living. The course should emphasize the study of human learning; biological and social motivation; behavior adjustments in the solution of intellectual, social and personality problems; individual differences in ability and experience, and the resulting variations in personality, achievement, and learning. Methods and problems involved in the prediction and control of human behavior should be stressed.

It is especially recommended that those topics receive special emphasis which will aid the student to adjust to wartime conditions and contribute to his usefulness in the years when peace is to be achieved. The Committee believes, for instance, that psychology can be of more immediate service if time-honored and classical references are replaced by data more relevant to modern problems; if, for example, discussions of learning deal with human learning in personal and social adjustments as well as in the acquisition of skills; "heredity" with the problem of human traits and drives as related to biological inheritance and also to the social environment in which they are developed and utilized; perception with current problems in the Army Air Force. Many other examples will occur to the instructor. Special attention should be given to problems of social behavior, since the issues of the war raise emphatically the need for understanding the relation of men to each other.

There is, as is well known, a division of opinion as to how the basic course can best accomplish its function in the general education of the student.

Some psychologists prefer to organize their teaching about topics selected as representing the major concepts and principles of psychology. To them the Committee suggests the need of carefully relating these topics to contemporary problems, utilizing illustrations, experiments, and other materials which can be carried over by the student directly into his daily life. These psychologists will find in *Outline A* (below) an organization which utilizes the topical chapter headings in most standard textbooks. Under each general heading are suggested sub-topics which will relate the discussion to contemporary problems. The outline is intended to be suggestive and not final. The order of topics is flexible; instructors

are urged to change and amend as they see fit. Many sub-topics are arbitrarily classified and may be switched to other headings. For supplementary reading the book "Psychology for the Fighting Man" being prepared by Professor Boring and a special subcommittee of the National Research Council's Emergency Committee in Psychology should be a useful reference. This book will be published during the early months of 1943. For supplementary reading the instructor is also referred to the reading references below.

Outline B has been prepared for those psychologists who believe that a course built about selected problems is to be preferred to one built about the conventional topics used in most textbooks. Many psychologists are convinced that a course so organized will more effectively fulfill its function in the student's general education, and also that it may bring about a needed revitalization of psychology. In *Outline B* the topical headings are contemporary problems, and representative readings are grouped about sub-topics under them. In such a course, organization naturally changes as problems rise and fall in relative importance in the life of the student and in society. This outline, too, is intended as suggestive and not final.

Following the outlines is appended a list of *Instructional Techniques*, suggested as appropriate to courses following either mode of organization.

Outline A: General Introductory Course

1. *Heredity and Environment*

   Is the tendency to fight inherited; is cruelty "innate"?
   The "roots" of war;—in nature or nurture?
   The influence of tradition and of culture patterns (e.g., Japanese).
   Are some nations more warlike than others?

2. *Individual Differences*

   What are the ranges of human abilities which must be recognized in war and peacetime selection problems?
   Race: attitudes conducive to war and peace.
   Sex: women as substitutes for men in industry, Waacs, Waves, etc.
   Age: importance in military service, leadership, industrial efficiency, progressive government.
   Tests in the service: intelligence, personality, psychiatric, aptitude.
   Problems of military personnel: selection, classification, training.

3. *Motivation and Adjustment*

   Are there instincts; is pugnacity an instinct?
   What "drives" may be utilized for peace?
   What are the *dependable* motives, how may they be used in war?
   What factors enter into effective propaganda: radio, movies, newspapers, books.
   Factors in military discipline: love of country, respect for commander, influence of associates.

4. *Perception and Observation*

   Sound localization in airplane observation; judgment of distance and depth; time judgment.

Problems of aviator selection; night flying; three-dimensional vision; coordination of hand and eye.
Color-blindness; improvement through vitamin feeding; handicap of color-blindness.
Errors of perception; how measured and how important.
Camouflage.

5. *Learning and the Acquisition of Skill*

Most effective methods of training men to be soldiers; factors of practice, law of "effect," creation of morale.
How to measure learning ability; verbal, motor, social.
Time and motion studies.
Training of low-grade; salvage of handicapped.
Women in industry.
"Toughening" process in training, value of.
Learning in personal and social adjustments.
The acquisition of attitudes, prejudices, etc.

6. *Emotions*

Can fear be controlled; its physiological basis; how fears are learned and how eradicated.
Does advice to "keep calm" prevent fear? Why?
Facilitating effect of anger; should soldiers be urged to hate the enemy?
Can emotional tension be measured? How?
Emotion and fatigue; second wind; leadership and emotional control.
Family disruption, influence on children's fears and anxieties.

7. *Intelligence*

Definition and measurement; intelligence tests in Army, their use, value, and limitations. Other tests.
Sex and race differences in intelligence.
Vocational selection and intelligence.
Individual differences in intelligence.
Combination of intelligence tests with other tests in selection for occupations.

8. *Personality*

How are personal qualities estimated in Army; personality resemblances and differences in officers and men.
Personality traits shaped by training and culture (Japanese).
Personality factors in the control of men; can they be developed?
Maladjustment to Army life; causes of; treatment of.
Detection of trouble-makers; personality characteristics of.
Common abnormalities; how to recognize; what factors are they related to?
Attitudes; how to measure; importance of; propaganda and.
Profile necessary for: paratrooper, divebomber, officer, first-aider, one who cares for children of working mothers.

Other topics recommended are:

9. *Child Psychology*

Delinquency caused by War.
Preparation for evacuation, bombing, blackout, etc.

Explanation of war to children.
Influence of adult war attitudes and fears on children.

10. *Psychological Problems of Women in War Activities*
Nursing, occupational and physical therapy.
Care of children.
Industry.
Farming.
Waves, Waacs, etc.
U.S.O.
Red Cross.
Civilian defense.

11. *Fields for Psychological Technicians*
Government departments.
Armed forces.
Civilian activities.

Outline B. General Introductory Course

1. Problems of understanding, predicting, and controlling human attitudes, opinions, and behavior.
   a. *Mainsprings of action. Roots of social behavior, and of war and peace.*
      (1) Dollard, *Frustration and Aggression*, 1939
      (2) Durbin and Bowlby, *Personal Aggressiveness and War*, 1939
      (3) Cantril, *Psychology of Social Movements*, 1941
      (4) Prescott, *Emotions and the Educative Process*, 1937
      (5) Tolman, *Drives Toward War*, 1942
      (6) Drucker, *The Future of Industrial Man*, 1942
   b. *Surveys of public opinion and attitudes*
      (1) Albig, *Public Opinion*, 1939
      (2) Gallup and Rae, *The Pulse of Democracy*, 1940
      (3) Lasswell, *Democracy through Public Opinion*, 1941
      (4) Lazersfeld and Stanton (Eds.), *Radio Research* 1941
   c. *Propaganda and rumor*
      (1) Doob, *Propaganda, its Psychology and Technique*, 1935
      (2) Freeman, *Conquering the Man on the Street*, 1940
      (3) Various, *Institute for Propaganda Analysis*
      (4) Lerner, *Ideas and Weapons*, 1939
      (5) *Safeguarding Military Information* (film), OWI, U. S. Govt.
   d. *Morale and esprit de corps; authority and leadership*
      (1) Dollard, *Victory over Fear*, 1942
      (2) Rothlisberger and Dickson, *Management and the Worker*, 1941
      (3) Watson (Ed.), *Civilian Morale*, 1942
2. Problems of effective utilization of different individual capacities
   a. *Personnel selection and placement in the military services, in civil service and in industry*
      (1) Greene, *Measurements of Human Behavior*, 1941

(2) Pennington, Hough and Case, *Psychology of Military Leadership*, 1943
(3) National Research Council Committee, *Psychology for the Fighting Man*, 1943 (To appear)
(4) Viteles, *The Science of Work*, 1934
(5) Moore and Hartmann, *Readings in Industrial Psychology*, 1931
(6) Bell, *Youth Tell Their Story*, 1938

b. Problems of training

(1) Viteles, *Industrial Psychology*, 1933
(2) McGeoch, *Psychology of Learning*, 1942

3. Problems arising out of strain: conflict, frustration, adjustment

a. Behavior not socially acceptable

(1) Reckless and Smith, *Juvenile Delinquency*, 1932
(2) McKinney, *Psychology of Personal Adjustment*, 1941
(3) Shaffer, *Psychology of Adjustment*, 1936
(4) Davis and Dollard, *Children of Bondage*, 1941
(5) Rogers, *Clinical Treatment of the Problem Child*, 1939

b. Breakdowns in war-time: war neuroses

(1) Miller et al., *Neuroses in Wartime*, 1940

4. Problems of leadership, social control, and social change

a. How primitive societies solve their problems

(1) Benedict, *Patterns of Culture*, 1934
(2) Mead, *From the South Seas*, 1939
(3) Kardiner, *The Individual and his Society*, 1939

b. Social psychology of contemporary life

(1) Lynd, *Middletown*, 1929; *Middletown in Transition*, 1937
(2) Warner et al., *Social Life of a Modern Community*, 1941
(3) Mumford, *The Culture of Cities*, 1938
(4) Cantril, *Psychology of Social Movements*, 1941
(5) Plant, *Personality and the Cultural Pattern*, 1937

Suggested Techniques of Instruction Applicable to Wartime Needs

1. Clipping collection, Psychology and War, assembled by students, posted and discussed.
2. Propaganda techniques gathered constantly from newspapers, radio, movies, books, etc.
3. Radio assignments of programs such as Town Hall Meeting, presenting two sides of controversial issues of psychological interest.
4. Studies of races and nations from authentic pre-war sources, revealing accomplishments, customs, and characteristics for a better understanding of post-war federation problems.
5. Regular classroom reports on wartime psychology published in the Psychological Bulletin.
6. Instructional films, including those released by the Government as part of its information service, e.g., Democracy in Action, Americans All, Men and the Sea, Women in Defense, Building a Bomber.

II. Special Training Courses for Immediate Service

Most special training courses will be given as parts of the training programs of the Army and Navy. Positions as psychological technicians in the armed forces will be filled by students assigned to these courses as part of their military training. Outside the Army and Navy programs, some courses, intended especially for women, will give training in child care, industrial personnel work, and psychological needs and facilities.

Though most special training courses will be officially designed by the Army and Navy, it is not inappropriate to make general suggestions concerning them.

The proper selection of students for training is of major importance. Those chosen should be emotionally stable, personally acceptable, intelligent young people, able to carry out orders and to work cooperatively with others. Because mature personality is a major requirement for the work, it does not seem desirable to select those just out of high school. It is suggested that the training be given only to advanced undergraduates and college graduates who possess the necessary qualifications in intelligence and personality. It is preferable that they have had training in psychology and the social sciences, including research techniques, but a high order of intelligence is more important than antecedent course work.

Training along the following lines is recommended:

1. *Statistical Methods*, with special reference to test construction, evaluation and interpretation.

2. *Standard Test Methods*, including practice in the administration of individual and group tests. Such training should include supervision in the clinical interpretation of the individual test.

3. *Other Personnel Methods*, including the use of interviews, ratings, questionnaires, attitude scales.

4. *Clinical and Abnormal Psychology*, with training in diagnosis of personality maladjustments, administration and interpretation of individual tests, remedial techniques, special training methods.

5. *Experimental Methods*, including knowledge of apparatus, use of controls, experimental design.

6. *Social Psychology*, with special reference to the socialization of the child, social motives, attitude and opinion studies, special aspects of the social situation in industry and in the Army and Navy.

7. *Vocational and Industrial Psychology*, with attention to job analysis, motion and time studies, working conditions, selection of personnel, problems of morale.

It is important that special training be given within a framework of general understanding of psychological problems. It is also important that personal fitness be determined through supervised work in which the student experiences demands upon him, closely related to those which he will find in the actual work for which he is training. The Committee believes therefore that the following principles should be followed in planning special training programs:

(1) A basic knowledge of human behavior must not be neglected in favor of methods. Without a sound background in psychology, methods will be mechanically and unintelligently applied.

(2) Basic methods should be taught rather than specific techniques useful in some one agency or service. The student must—and will—acquire his special training on the job.

(3) Classroom work should be supplemented and illustrated by actual apprenticeship, supervised work in institutions, clinics, business firms, social agencies, and the like.

III. The Training of Research Specialists

In setting up and administering a program of psychological research, whether it includes technical experimental procedures, guidance, special training, opinion survey or some other field, a small—but increasing—number of highly trained men and women is urgently needed. No formal program can be laid down by the Committee for these specialists, whose training is at the Ph.D. level. However, in the light of what is now being done by research psychologists in the military service and in civilian agencies, the Committee strongly recommends that in current training for Ph.D. degree stress be placed on experimental and other research procedures, psychometrics (including test construction), learning, personnel methods, social psychology and abnormal psychology.

Committee of the American Psychological Association
on College Curriculum Adjustments

H. B. English
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BOOK REVIEWS

HURLOCK, ELIZABETH B. Child development. New York: McGraw-Hill. 1942. Pp. xiv+478.

Hurlock's book is a college textbook in child psychology, although the title "Child Development" may suggest a wider range of subject-matter. While the book gives some attention to physical growth, it does not attempt to cover such topics as the health, nutrition, immunology and endocrinology of the child. The emphasis upon behavior is paramount, and the chapter headings are the conventional topics of child psychology texts.

There are many favorable things to be said concerning Hurlock's text. It is soundly based upon modern experimental investigations of child behavior, with frequent references to specific studies. The author's accounts of these investigations are concise and clear. The book throughout is very readable. This is due in part to the author's style, in part to the excellent organization into topics and sub-topics, each indicated by an appropriate heading, and in part to the numerous illustrations, charts and tables which accompany the discussion. A notable feature of the text is its fairly uniform coverage of the entire period from birth through adolescence; most child psychology textbooks lean too heavily on the preschool years, and, of course, most of them do not include the adolescent period. There are unusually full chapters on religion, on sex development and on forms of self-expression.

The weaknesses of the book are not peculiar to it, but are shared by most textbooks. Why do authors place alongside of perfectly good observational material a multitude of ex cathedra pronunciamentos which have no observational support? Hurlock does this frequently: "Adolescent snobbishness and rudeness are outgrowths of self-assertiveness (243)." This is merely a hunch of the author, but how is the student to know that it is not a well-established view? "Before the baby forms definite concepts about other people, he forms concepts about himself (389)." How could anybody know this? "The *emotionality* of the baby between the ages of six months and two and one-half years may be traced to the cutting of teeth (102)." This is a very exceptional view, but the student is not told that there is anything unusual about the doctrine. These are not merely isolated statements. For instance, the author has a section of several pages on adolescent stages of love (calf-love, puppy-love, romantic love) which are completely lacking in documentation. Many of her statements concerning adolescence are of that character. We have no objection to the author's holding opinions on these topics, but her opinions are presented to the student in a way which confuses them with fact. Let us emphasize again that this does not occur any more often in this book than in many others. The shame is that it occurs at all.

Some topics which usually appear in child psychology texts are omitted in this book. While there is a chapter on the "Development of Understanding," there is no treatment of the development of intelligence, practically no discussion of the nature-nurture question in regard to

intelligence, no reference in this regard to the studies of Wellman, of Freeman, Holzinger and Newman, of Leahy, etc. Similarly, there is little mention of gifted and retarded children. The author apparently feels that the discussion of intelligence belongs in a separate course. There is something to be said for that point of view, but whether the instructor likes it or not, students will certainly introduce questions of intelligence into the child psychology course.

The absence of a chapter on learning and on personality constitute other notable omissions. To be sure, these topics are dealt with to some extent in other sections, but many teachers would probably wish separate treatments of them.

Other topics are given a treatment incommensurate with their importance. Juvenile delinquency is taken care of in two pages; Hartshorne and May's three volumes are reduced to one page; Piaget's extensive studies are accorded three paragraphs. We appreciate the enormous task of compression which confronted the author, but the *relative* space given to these investigations should have been greater.

A very useful bibliography of about 850 titles is appended. However, the names of not more than half of the authors appear in the index and consequently, one must infer that, unless the index is incomplete, many of them are not referred to in the text.

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CASIELLO, LUIS. El enfermo mental y su asistencia. Foreword by Alejandro Raitzen. Rosario: Librería y Editorial Ruiz, 1942. Pp. 45.

In Santa Fe Province, Argentina, as well as elsewhere in the world, an increasingly acute need for adequately extensive institutional facilities for treating the insane has become manifest. The seven brief chapters of this book constitute a layman's campaign to characterize for the responsible public a local need and the means of meeting it. His account of the nature and incidence of mental disorder is an admirably compact and lucid presentation of the relevant facts, and his grasp of the purport and methods of modern psychotherapy might be a revelation to some academic psychologists. Excellently selected statistical material is included, as well as a novel consideration of the "economics of occupational therapy."

HOWARD DAVIS SPOERL.

American International College.

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NOTES AND NEWS

BARBARA S. BURKS, research associate, Columbia University, died Tuesday, May 25, 1943, in New York City, at the age of forty years.

ROBERT A. BROTEMARKLE, professor of psychology and personnel officer of the college at the University of Pennsylvania, has been appointed director of the psychological laboratory and clinic and chairman of the department of psychology to succeed the late EDWIN B. TWITMYER. Dr. Brotemarkle has resigned as personnel officer, a position which he has held in conjunction with his teaching activities since 1926.

M. M. WHITE, professor of psychology and acting assistant dean, College of Arts and Sciences, University of Kentucky, has been appointed head of the department of psychology, succeeding the late J. B. MINER.

JACK W. DUNLAP, on leave from the University of Rochester, has resigned as director of research of the Committee on Selection and Training of Aircraft Pilots of the NRC and has accepted a commission as Lieutenant Commander in the Navy. He is attached to the Aviation Psychology Section of the Bureau of Medicine and Surgery and is working on problems of selection of aviation personnel.

EDGAR A. DOLL, director of the department of research at the Vineland Training School (N. J.) since 1925, has been chosen director of the Bonnie Brae Farm for Boys at Mellington (N. J.). In announcing Dr. Doll's acceptance, former Judge HARRY V. OSBORNE, chairman of the Bonnie Brae Farm Board of Managers, said: "For the past seven years Dr. Doll has served Bonnie Brae Farm as consultant psychologist, and Bonnie Brae is most fortunate in having secured his services as its permanent director. Dr. Doll and his family will live at The Farm, and it is our hope to make Bonnie Brae Farm a center of experimentation and research in its important field of service."

JOSEPH U. YARBOROUGH, professor of psychology, Southern Methodist University (Dallas, Tex.), has returned to the University after a two-year leave of absence during which he organized and established a program of merit selection for employees in the Social Security agencies in the state. Dr. Yarborough was recently elected president of the Association of Texas colleges.

HERBERT A. CARROLL, associate professor of psychology at the University of New Hampshire has been promoted to a professorship.

At the meeting of the Society of Experimental Psychologists held on April 9, 1943, at Columbia University, the Howard Crosby Warren Medal was awarded to PROFESSOR STANLEY SMITH STEVENS, of Harvard University. The citation reads: "His analysis of psychological pitch has revealed both its quantal structure and its functional relation to stimulus-frequency."

The National Research Fellowship Board in the Natural Sciences of the National Research Council has appointed HERMAN A. WITKIN (Ph.D.

in psychology, New York University, 1939), of the New School for Social Research to a fellowship for the academic year 1943–1944. The subject of Dr. Witkin's research is "The role of visual and postural factors in the determination of the constancy of the perceived vertical and horizontal."

The John Simon Guggenheim Memorial Foundation has announced the 18th annual series of awards of Guggenheim fellowships. Among the 64 awards for the year 1943–44, are to two psychologists as follows: DR. BARBARA S. BURKS, research associate in psychology, Columbia University: To gather materials for a book on the role of twins in the study of man, based on case studies of the development, life adjustment in maturity and environmental history of identical twins separated in infancy and reared apart; DR. SOLOMON E. ASCH, assistant professor of psychology, Brooklyn College: To prepare a book on the formation and change of opinion and attitude, based upon experimental investigations.

In the April 9th issue of *Science*, EDWARD A. HENRY of the University of Cincinnati, reports on the number of doctoral dissertations accepted in the various sciences for the years 1934–1942, inclusive. Psychology ranks third in the list, with a total of 1,028 doctoral dissertations for the entire period distributed by years as follows: *1934*, 104; *1935*, 101; *1936*, 118; *1937*, 112; *1938*, 108; *1939*, 123; *1940*, 120; *1941*, 117; *1942*, 125. An analysis of doctoral dissertations accepted by universities shows the replacement of the private universities by the great state universities, who now take top rank in the number of degrees granted.

On May 9, a psychology seminar was dedicated to the late JUNE E. DOWNEY jointly by the faculty of the department of psychology and philosophy, University of Wyoming, and by the University's chapter of Psi Chi, of which Dr. Downey was a charter member. RICHARD UHRBROCK, director of industrial relations, Procter and Gamble, formerly a colleague of Dr. Downey in the department, gave the commemorative address. On this occasion gifts from Dr. Downey's friends were added to the June E. Downey Library Fund.

At the March meeting of the Chicago Psychological Club, DR. HAROLD C. TAYLOR, Western Electric Company, spoke on "A Review of the Psychological Activities at the Hawthorne Plant." At the April meeting, DR. MANDEL SHERMAN, director of the Orthogenic School of the University of Chicago spoke on "The Use of Electro-Encephalograms in Experimental Studies of Emotional Frustration."

At the spring meeting of the National Academy of Sciences on April 26 and 27, LEONARD CARMICHAEL of Tufts College, and CALVIN P. STONE of Stanford University, were elected Members of the Academy, and WALTER R. MILES of Yale University was elected a Member of the Council of the Academy.

STEUART H. BRITT, recently commissioned Lieutenant D-V(S), USNR, leaves his position as Director of The Office of Psychological Personnel. The Office will continue however and communications addressed to it will receive prompt attention.

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Psychological Bulletin

CHILDREN AND WAR

ARTHUR T. JERSILD AND MARGARET F. MEIGS
Teachers College, Columbia University

This review deals with the impact of war upon children as revealed by findings in systematic research studies, reports by observers in the field, and by governmental agencies. It must be regarded as an interim report, since most of the studies that have been made in connection with the present war are limited in scope, and investigators are not as yet in a position to probe some of the long-term effects. Moreover, there is little or no available scientific literature dealing with the condition of the millions of children who live in several belligerent or invaded areas in Europe and Asia and who, to varying degrees, are subject to malnutrition and other ravages of war.

Reference will also be made to material dealing with the war of 1914–1918. This material is quite meager, as contrasted with the mounting volume of literature in the present war, for which earlier reviews, bibliographies, and books and articles aimed primarily at parents, are **8**, **22**, **33**, **35**, **48**, **53**, **64**, **113**, **117**. In the *Bulletin* of September, 1918, a general review of child psychology for the preceding two-year period (**86**) mentions only one empirical study dealing with children's reactions to war. More extensive are the reports dealing with physical health and growth during and following the war of 1914–1918, but even these offer relatively little concerning the long-term as distinguished from the immediate effects of wartime ordeals. It is to be hoped that plans for the relief and rehabilitation of populations in stricken areas during and following the present war will include some provision for follow-up research.

Children's Information, Concepts, Attitudes, and Emotional Reactions to the Idea of War

The impact of war on a child will, of course, be influenced to some degree by his understanding of what is happening, his ability

to grasp the implication not only of events that he can perceive but also of happenings on distant fronts. These larger implications, including apprehensions and hopes with regard to the future, play an important role in the concerns of an enlightened adult.

Available findings indicate that children's understanding of the meaning of war shows characteristics that parallel the developmental trends that have been noted in studies of children's grasp of other more peaceable social issues. There are increases with age in the amount of knowledge that children possess and in the extent to which they grasp the concept of war. On the other hand, the younger child may exhibit attitudes, such as strong partisanship against the enemy, similar to those shown by the more knowing older child. While his lack of understanding may render him immune to some apprehensions that disturb adults, he may still be affected by worries betrayed by his elders.

Various studies indicate that the concepts concerning war exhibited by a large proportion of children below the age of 12 involve much in the nature of disconnected snatches of knowledge, or confused understanding of military and diplomatic events, international complications and geographical relationships. However, individual children as young as 6 or 7 years may possess a rather large store of information concerning the progress of the war, the alignment of belligerents, the civil and military leaders, and the prevailing campaigns (**42**).

Kimmins (**73**) briefly describes findings obtained from essays written a little more than a year after the outbreak of the war of 1914–1918 by 1511 British boys and 1570 British girls of elementary school age, who were told to write as much as they could about the war in 15 minutes. The results are not presented quantitatively in terms of a well-defined list of categories, but in the form of descriptive accounts. Kimmins reports that at 8 years children's statements gave a blurred account of various activities involved in the conduct of war and a "confused mass of actions and ideas," including references to guns going off, ships sinking, and the like. At 8 years and at succeeding levels, girls gave considerably more emphasis than did the boys to the human aspects, the sufferings of the soldiers and of Belgian children, of heroic deeds, of hardships suffered by relatives, and of the impact of war on the home by way of scarcity and dearness of food, etc. There was an increase with age in amount of detail and expression of

opinion. It was not until about 11 years and thereafter that a substantial number of children dealt not only with the immediate present but also with the recent past, made references to the future, discussed the origin of the war, regarded the war as a connected whole, referred to higher motives, such as freedom, weighed the chances of success, showed some realization of the war's magnitude, with some sense of proportion and with less attention to particular events. At all ages there was little reference to Britain's allies, other than Belgium, or to Germany's allies.

The most comprehensive study dealing with children's information and ideas concerning war is an investigation by Preston (**95**) undertaken early in 1940, before the war had become much of a reality to the children in our own country. A test of information, based upon a careful gleaning of topics prominently in the news, and a test of attitudes were administered to 581 8–15 year-old children in the metropolitan New York area. The average IQ was 111.3; the population was above average in socio-economic status. One hundred of the children were also questioned in private interviews.

The average percentage of correct replies on the informational part of the test was 60 at age 9–10, 66 at 11–12, and 79.7 at 13–14. Larger differences were found when children were grouped according to mental age levels. Larger age differences were also noted in connection with specific items of the test. For example, at age 9–10, 55% and 62% failed items relating to the relative size respectively of the German *versus* the British air force and the British *versus* the German navy. The corresponding percentages of error at 13–14 were 35 and 18. The correlation between information scores and ratings with respect to attitude was only .14. Preston concludes that at the time of his study "a rather large proportion of children under about 13 years appear to lack a spontaneous attraction toward, preoccupation with, and capacity for mastering the intricacies involved in a war situation." Both Kimmins and Preston note a good deal of confusion in the ideas of the younger children; both note a good deal of ignorance or unawareness with regard to the international aspects of the conflict.

Bender and Frosch (**10**), in a study in 1942 of 40 children 7–13 years old who were patients in a psychiatric ward, report that children showed a tendency to visualize the war concretely; their response was on a perceptual rather than a conceptual level.

Many of the children were uninformed concerning the alignment of the belligerents and concerning leaders in various countries. A lack of discernment concerning the possible economic and domestic consequences of war was noted in a study by Cronbach (26) of 498 high school pupils in November, 1941.

Preston repeated his 1940 procedures, with adaptations, in 1942, to explore changes that might have occurred in children's answers by reason of our participation in the war. Tentative findings (privately communicated), limited to 25 children, indicate an increased absorption in the war without a corresponding increase in accuracy of interpretation of events as reported in the news. A somewhat increased concern with the war after our own country became involved was noted also by Tangney (107) in a study of high school children's interest in various features of daily newspapers. Bender and Frosch (10) report that from February, 1942, to June, 1942, there was a tendency toward more blaming of the German people, as distinguished from Hitler alone, and increased indications of some understanding of the global scope of the war.

In a study of a somewhat select group of 21 first-grade children (mean IQ 120) in the winter and spring of 1943, Geddie (42) found that the median child correctly named and identified the leaders of three of the belligerent nations and correctly indicated three parts of the world in which American troops then were located, and some of the young children were able to give quite accurate reports of the current status of campaigns in various sectors. The fact that children at or near the adolescent level are interested in factual information and in matters both of personal and social responsibility is indicated in returns obtained by Corey (24) when pupils in four high school classes (exact enrollment not specified) in Chicago were asked early in 1942 to write questions concerning the war.

Under the auspices of the Boy Scouts of America (123), information concerning some reactions of boys of Scout and Cub age was obtained in the summer and fall of 1942 through interviews with 633 children and adults widely distributed geographically. Over two-thirds of the adults who were interviewed reported that the behavior of children had changed since the war began, notably in the direction of a new consciousness of worldwide problems and a more serious interest in current affairs. Four out of every 5 boys stated that "something might happen

here" (in the form, for example, of air raids, sabotage, espionage, invasion). Such opinions were more widespread among older boys and among boys living in metropolitan areas than among younger boys and boys living in smaller communities.

Attitudes toward War and War Service. Before and shortly after our country's involvement in the present war, many studies of children's attitudes showed notable absence of a tendency to glorify war and warriors, or to look upon war as an adventurous enterprise. In studies by Preston (**95**) and Bender and Frosch (**10**), desire for material gain or to protect material advantages was mentioned most frequently as a cause of war. Kimmins (**73**) in 1915 found that mention of noble motives for waging war was not common until near the end of the elementary school period. Forty-three per cent of the boys in Preston's study and 47% of the girls expressed doubt as to whether war can ever be abolished.

References to war as terrible, dreadful, full of killing, and the like, were prominent in essays by 55 sixth-grade children in an unpublished study by Gastwirth and Silverblatt (**41**).

At 9–10 years, 73% of the children in Preston's study (**95**) rated the head of an army as "more important" than the head of a police system or the head of a school; at 13–14 years, only 18% named the head of an army as being most important. When explaining their motives for choosing the branch of war service they would prefer, 52% of the boys and 17% of the girls showed regard for their own personal safety; 23% and 30% respectively made choices in terms of avocational interests, and only 10% and 7% mentioned a desire for adventure as the reason for their choice. In a study by Bell (**9**) conducted in 1935, 11.9% of male youth aged 16–24 reported that they would refuse to enter the armed forces. The reviewers do not have data with respect to the percentage of youth who proved to be conscientious objectors after our involvement in the war, but the percentage is undoubtedly much less than 11.9.

Some investigators (**10, 26**) express the opinion that viewpoints such as those reviewed above reflect pacifistic sentiments widely held by adults in the interim between the war of 1914–1918 and the present war. In a study (**66**) which noted a tendency toward a shift away from extreme pacifist attitudes during the years 1936–1938 in California at the high school level, it was noted, among other matters, that "extreme left" pacifists were among those who swung sharply in favor of a policy of war against

peace-breaking nations. Findings concerning changes in attitude at the college level have been reported by V. Jones (**68**). In a study by Sherman (**98**) conducted during the months of June and July, 1942, written or oral expressions concerning the war were obtained from 7000 Chicago children of high school age. The attitudes expressed by the children were classified under six headings with frequencies as follows: definite antagonisms toward the war, 5%; critical attitude, 6%; indifference, 21%; confusion about the war and its issues, 12%; mildly favorable, 9%; favorable, without criticism, 26%; strongly favorable, including vindictiveness toward the enemy, 21%.

War Play. The penetration of the war into children's play has been noted in several studies (**7, 10, 33, 42, 95**). According to observations communicated to the interviewers, war play is prominent in the play of kindergarten children in many localities, and it appears also in the play of nursery school children. War play has been observed to be considerably more prominent among boys than among girls (**42, 95**).

Emotional Response to War Themes. The matter of children's emotional reactions to the ideas or reminders of wartime happenings (as distinguished from actual bombing or evacuation) has been touched upon in some studies. Bender and Frosch (**10**), in the study conducted after our entry into the war, found relatively little anxiety traceable to the war in the dreams reported by children in a psychiatric clinic. Other studies report that dreams about the war were mentioned by 8 of 29 normal sixth-grade children interviewed in the spring of 1942 (**41**), and by 9 of 21 first-grade intellectually superior children interviewed in the spring of 1943 (**42**). Bender and Frosch (**10**), report that their subjects responded with relish to a puppet show, on a war theme, which some adult previewers had disapproved as too harrowing for children. They cite this as an example to indicate that the meanings and attitudes associated by adults with the idea of war may be quite different from the associations aroused in children. They also report that their subjects apparently did not anticipate or visualize a danger in the future and react to it in terms of anxiety, but they note that children with severe personality disorders showed a tendency to weave their own problems into the war situation. Despert (**33**) also describes ways in which war themes may be introduced into play and fantasy by disturbed children.

The youngster who is unable, to the same degree as an adult,

to anticipate and fear future events may still react with strong feeling to the idea of circumstances that might touch upon his own personal life, such as the possibility of being evacuated without his parents (**10**, **41**).

Informal inquiries by the reviewers indicate that since 1941 the war has increasingly been brought home to children as more and more relatives or acquaintances have gone into the armed forces. Moreover, the extent to which children report that they have been troubled will be influenced to some degree by the recency of striking events. In the study by Gastwirth and Silverblatt (**41**), the responses of 27 in a group of 29 sixth-grade children indicated that the children had experienced fear, sadness, or dislike when witnessing movies of bombings. Twenty-four of the 29 children who had experienced a false air raid alarm early in the war stated that they had worried concerning their own safety or the safety of their families. The children also were disturbed when the first practice air raid alert occurred in school, and all 29 reported that they felt an easing of tension when they discovered it was only a drill. Many of these reactions apparently were temporary and episodic in nature, but it appears that none of the children had been spared from at least temporary emotional reactions to the war.

Ideas concerning Participation in War Effort. Children's ideas as to how they might participate in the war effort have been touched upon in various investigations. Unquantified observations on this subject relating to the war of 1914–1918 have been reported by Kimmins (**71**) and by Ping Ling (**79**). In the Boy Scout study (**123**) referred to above, conducted in 1942, it was found that half of the boys of Scout age did not know about 4 war activities which have been labeled as jobs for boys (plane spotting, assistant fire watcher, first aid assistant, messenger). A large proportion of boys (over 60% of children aged 9–11, 12–14, and 15 or over) indicated that they would like to have "more important jobs" to do. Findings in a study of questions raised by high school pupils early in 1942 likewise indicate that many children of adolescent or near adolescent age have felt that they were not being asked to contribute as effectively as they might (**24**).

Evacuation

Findings with regard to the response of children to evacuation are of interest not only by virtue of their bearing upon wartime

policies but also by virtue of the light they throw upon behavior tendencies that operate also in times of peace.

A brief item regarding evacuation in Germany has been reported by Ansbacher (**5**). Although large-scale provisions for evacuated children have also been made in Russia, and no doubt in other belligerent countries, little in the nature of systematic reports from countries other than Britain has been found.

In England the first major evacuation involved approximately one and a half million persons (**92, 141**), including school children, mothers and their young children, and various other smaller groups. When the expected bombings did not materialize, large numbers began to return home (**92**). Large numbers did not participate in the first major evacuation (**32**). The extent of re-evacuation when violent bombings actually began has not been reported precisely. In any event, the number of children who have, at least temporarily, vacated their own homes reaches an enormous total.

Pronouncements and General Aspects of Evacuation. Some writers voice the opinion that the immediate effects of evacuation, when it involves separation from parents, is worse than the immediate effect of air raids, and that it is a greater shock to a child to be separated from his parents than to experience a bombardment (**17, 40**). Again, it has been asserted that even under the best conditions the break-up of the family makes for loss of emotional security (**58**). It has also been maintained that symptoms arising from the effect of bombing usually disappear quickly, while those associated with separation from the home are more persistent (**139**). As against these views there is the contention that evacuation to a safe area is preferable to having the child exposed even to a relatively "harmless" raid (**87**) and, more important, the findings in several studies (reviewed below) to the effect that most children seem, at least outwardly, to be able to make a good adjustment to evacuation and that increases in delinquency and nervous disorders have been considerably smaller than many had anticipated (**18**). Available evidence does not warrant sweeping generalizations concerning the comparative ill effects of bombing and evacuation.

By reason of differences in technique and the different age groups involved in different studies, no over-all summary statement of the percentage of good or unfavorable adjustment at various age levels can be given. In the most elaborate study of

evacuated children, consisting mainly of children of school age or older (**62**), 8.2% of the children were rated as unhappily adjusted in their new homes. Burt (**19**) mentions a report to the effect that 94% of a group of 275 children evacuated from Liverpool were "very happy," and states that this tallies with his own impressions, but notes that these observations are subject to certain reservations. Several studies give a higher estimate of poor adjustment.

Whatever the estimate may be, it is subject to various reservations. First, the most systematic studies deal with children who have been evacuated for some time and do not provide complete information concerning the initial reactions of the youngsters, or of the status of the children who previously had returned home, or of the children who for one reason or another were kept at home from the start. Second, of necessity the studies deal mainly with the relatively short-term effects and not with the question as to what long-term benefit or harm the children may have sustained. Procedures used in arriving at a rating of adjustment have differed and so also, undoubtedly, have standards as to what constitutes satisfactory adjustment. Rating schemes have not as a rule been described in such detail that an independent worker could apply them in a study of his own. Some generalizations have no doubt been influenced by the observer's peacetime preconceptions.

Among the factors that have been noted by various writers (**18, 57, 62, 97, 112, 139**) as rendering evacuation more trying than an ordinary departure from home to a camp or boarding school are the following: evacuation takes place in a general atmosphere of uncertainty and sometimes danger; it is likely to be for an indeterminate period of time; while the child is adjusting to a new situation he also is subject to uncertainties concerning the safety and welfare of those remaining at home; younger children who are evacuated in the company of their mothers may indirectly be subject to the difficulties experienced by the mothers; there may be dislocation by reason of differences between the home and billet in wealth, education, and mores. Older children in some instances may, according to some accounts, feel a certain amount of self-disparagement about having forsaken the folks back home.

According to several studies (**10, 18, 19, 29, 41, 62, 112**), the response of children and parents to the prospect or actuality of evacuation has manifested the strength of family ties—the importance to the child of his parents and his home, even if the

economic circumstances of the home and the normal relationships between the child and his family are not ideal, and similarly, the importance to parents, notably the mothers, of their children. While many children returned home because of difficulties of adjustment in the foster home, it has also been observed that many children were brought home largely because their own parents were unhappy without them. Teachers who have been evacuated with their pupils to Cambridge (**62**) expressed opinions to the effect that the family unit was so essential a part of English life that evacuation should be avoided if possible, and that homes and schools should be provided with safe shelters; since this would be difficult to accomplish, evacuation should continue, according to these teachers, but authorities should plan farther ahead and institute a policy of decentralization on a permanent basis.

General Adjustment at Various Age Levels. Findings with regard to the response to evacuation at various age levels are rather conflicting. Burt (**18**) reaches the generalization that children under 8 years and over 12 years seem to have been most openly affected, but this is not confirmed by all studies. Difficulties of adjustment were more pronounced at the age of 13 and thereafter than at earlier age levels in one of the two groups of children included in the Cambridge Survey (**62**) but this finding was not supported by the other group. In this comprehensive study, information was obtained from foster homes, from teachers, from essays written by the children themselves, from clinics and from parents of children who had returned home.

Reports of a study by Alcock (**139**, **140**) give the age distribution of 420 cases referred to a clinic during a period of 16 months at an evacuation center, but the total number of evacuees at various age levels is not reported, so it is not possible to compute comparative percentages.

One hundred evacuated children ranging in age from 6 months to 4 years and 11 months, were studied by John (**65**). Information was obtained from the mother or the householder where the children were billeted, from the billeting officer or assistant, and from study of each individual child. It is reported that children from birth to 2 years seemed to suffer least. They were less acutely aware of the change. Older children in the preschool range seemed to suffer most. Excessive dependence on the mother, according to such information as could be obtained, appeared in 21% of the cases before evacuation and in 44% after evacuation. Of the 100 children in the study, 56 settled down satisfactorily and 44 did

not. This represents a larger proportion of unsatisfactory adjustment than has been reported in several other studies. It is not clear to what extent this difference may be attributed to the age of the children or to other factors.

Vernon (**112**) reports a study dealing with 186 adolescent girls, but no over-all rating of satisfactoriness of adjustment is given.

In the Davidson and Slade study (**29**) of 56 boys and 44 girls aged 11–14, information was obtained by means of interviews with the children themselves, with the children's own parents with two or more teachers, with foster parents, and, where possible, with other members of the household in the foster home. The findings in this study do not agree with the conclusion in the Cambridge Survey to the effect that there is a sharp rise in the incidence of unsatisfactory adjustment around the age of 13. Seventy of the 100 children were rated satisfactory in their adjustments (reasonably happy, and foster parents were pleased or at least willing to continue to keep them); 13 were rated as doubtful, and 17 were rated as having made an unsatisfactory adjustment to the foster homes. Seven of these 17, it is reported, had qualities that would make it difficult for them to adjust satisfactorily anywhere. Davidson and Slade state that it is likely that the percentage of unsatisfactory cases would be higher if the investigation had been made earlier.

Some Positive Effects. In a study by Boyd (**15**), teachers utilized a rating scheme to give their judgments as to changes that had occurred in the behavior of 70 10–14 year old children who had been or still were evacuated, as compared with 46 children who had stayed at home, more or less without benefit of regular schooling. Before definite conclusions can be drawn from the data, it would be necessary to have more precise information concerning the procedures and to obviate certain other reservations mentioned by Boyd. At any rate, it is interesting to note that, according to the judgment of the teachers, "on the whole, evacuation in the case of children who have stayed away long enough to be affected by it, has brought about an appreciable improvement in socially desirable conduct and a firming up of personal character, but that apart from a slight increase in timorousness, it has left unaffected the emotional life of children." A "slight increase in timorousness" suggests that possibly the improvement reported by the teachers was more in the nature of outward conformity than inner peace, but this must remain an open question.

Vernon (**112**) also reports that while many children respond

unfavorably to evacuation, some respond to the challenge of being thrown upon their own resources with greater independence and initiative and a bolder attitude toward life. Similar testimony is given by Adam (1) without a report of quantitative findings.

Burt (19) notes that although a considerable increase in the amount of "mild" and probably temporary nervous disturbances appears to have followed evacuation, such factors as removal from undesirable homes, improved physical health, and possibly the freer outlets afforded by rural life seemed to have resulted in a definite improvement in many children who previously had exhibited mild or serious disorders. Henshaw (57) comments that in a few cases children unwanted in their own homes have found happiness in foster homes. Vernon (112) found that while many adolescents missed the old friends and activities, some had learned to appreciate new friends and new leisure occupations.

In the Cambridge study (62), responses to a questionnaire by teachers who had been evacuated with their pupils showed "a substantial degree of agreement" in reporting that evacuation had brought about improvement in the health of children, in the children's personal appearance, in relationships between the children and their teachers, in relations among the children themselves, in self-reliance, and a broadening of children's interests and outlooks. The results of the questionnaire are not presented quantitatively, so the relative weight of these items of testimony cannot be gauged. The teachers alluded to above also reported various unfavorable effects.

Homesickness. One of the most commonly reported reactions of evacuated children is homesickness, embracing a large variety of longings for old associations, including "mother-sickness" (19), a yearning for the company of mother or father or both, a desire for a return to the old mode of life, or a hankering for specific features of the former surroundings. Burt (19) reports that when homesickness occurred, it usually came immediately in the case of the younger children, but only after a period of incubation in the older, after the novelty of the holiday trip to the country had worn off and after some of the restrictions in the new environment became boring or irksome.

In the Cambridge Survey (62), parents and relatives were mentioned most often both by boys and by girls when children responded to the topic, "What I Miss in Cambridge." As against this, foster parents were mentioned 54 times by girls and 37 times

by boys when they discussed what they "liked" in Cambridge. Second on both the boys' and the girls' list of things missed in Cambridge are "friends not evacuated."

Relations with Own Parents. Vernon (**112**) found that 75% of the girls who had returned home reported that their parents wanted them to come home. It is not unlikely that a homesick child might attribute his desire to go home to the desires of his parents for his homecoming. Moreover, a child's wish to return home may strengthen a parent's wish to have him back. But certainly it can be said that the studies of evacuated children emphasize not only that children "need" their parents but also that parents "need" their children. In general discussions of parent-child relationships, the former point frequently is emphasized to the exclusion of the latter.

As has been noted by other observers, Vernon reports that many children were unsettled by parental appeals for sympathy and loyalty. Against this, it should also be said that expressions of parental solicitude and affection may have a favorable effect (**62**) and, undoubtedly, in many cases appeals for sympathy, however disturbing they may be, would not cause as much distress as would absence of any kind of evidence of concern by the parent. Several investigators (**62, 89, 97, 108**) comment on the subject of communication between parents and evacuated children by way of visits, letters, gifts, and the like. Many observers emphasize the importance to the evacuated child of letters, gifts, and other tokens of affection from home.

In the Cambridge study (**62**), there was a higher percentage of unsatisfactory adjustment (22%) in the case of youngsters who received no parental visits than in the case of children who were visted less than once monthly (9% unsatisfactorily adjusted), or in the case of children who were visted more than once monthly (15%). Davidson and Slade (**29**) also found that among children who were frequently visited there was a lower incidence of unsatisfactory adjustment, but the difference fell short of statistical significance. They also point out that parental vists may have both good and disturbing effects. To what extent the factor of absence of visits as such, as distinguished from various factors which might underlie a lack of desire or of ability to visit, makes for the unfavorable showing of non-visited children would require further study.

Adjustment to Changes in School Work and Everyday Activities.

As already noted many difficulties have been encountered by evacuated children in connection with their adjustment to school (**19**, **62**, **97**, **112**). Difficulties may range from disturbances connected with dislocation of work habits, crowding in the new school, lack of adequate facilities and equipment, differences in academic and disciplinary standards, and the like. In the Cambridge study (**62**), the "home school" was mentioned 28 times by boys and 33 times by girls in accounts of "What I Miss in Cambridge." As against this, there were, respectively, 48 and 41 mentions of school in accounts of "What I Like in Cambridge." Teachers in this study reported that evacuees showed lowered powers of concentration and decline in rate of progress in school work. Burt (**19**) points out that the evacuation of teachers and pupils not only presents new problems and new difficulties but also new opportunities.

Another source of difficulty arose in connection with recreation and the use of leisure time (**19**, **62**, **112**), lack of customary playmates and facilities, and a considerable degree of boredom in the case of some children. On the other hand, many children commented on increased opportunity for various experiences, including outdoor activities, and upon the formation of new friendships.

Bed-wetting, Uncleanliness, and Other Conditions. Several reports emphasize the high incidence of bed-wetting shown by evacuated children. With the reservation that the percentages must be regarded as preliminary, Burt (**19**) estimates that incontinence was exhibited by 3.4% of children before evacuation and by 7.2% of a similar sampling of children after evacuation. In writings dealing with the subject, the bed-wetting of evacuees has variously been described as a continuation of habits that prevailed before the war, or as a new symptom arising out of the tensions associated with the experience of being evacuated (**19**, **43**, **57**, **62**, **139**, **140**). Both factors seem to have been operating to varying degrees in different children. Again, at least occasional incontinence might arise through circumstances, such as embarrassment about going to the toilet in the new home, fear of getting up in a strange place at night, or unfamiliarity with the layout.

The verminous condition of some evacuees, and disgust in response to lice shown by some workers at billeting centers have been noted by various writers (**18**, **20**, **57**, **62**, **92**). Similar trouble arose in the war of 1914–1918, in connection with the establishment of child welfare and recreation centers (**124**).

Difficulties of Parents. Parents of evacuated children have been faced with various problems, apart from loneliness and desire for the company of their children (**62, 97**). Mothers who accompanied their children to evacuation centers frequently were faced with the problem of separation from their own homes and husbands and many practical problems, such as adjustment to a new household. Parents who stayed at home faced problems such as uncertainty as to how long the separation from the home was to last, reluctance to be parted from a child who is growing and changing rapidly, perplexity concerning possible difficulty in adjustment when the child comes back, and the possibility of jealousy or other misgivings in their attitudes toward the foster parents, or resentment at the fact of being under obligation (**62**).

Parents whose children had returned from the evacuation billets in Cambridge most frequently gave the following reasons for bringing the child home: family ties; dissatisfaction with the foster home or a wish to avoid another change of billet; and financial, including, among other matters, extra expenses that were not adequately covered by billeting allowances.

Problems of Foster Parents. Many of the problems reported by foster parents are of the sort that one might expect when large numbers of families are called upon to provide substitute homes for strange children (**18, 19, 29, 57, 62, 97, 109**). There is not space here to list the various problems that might arise. Various writers recommend that group care rather than foster home care be provided for children with certain handicaps or characteristics. Among children who require special consideration according to Burt (**18**) are the physically weak, mentally defective, the dull, educationally backward, the temperamentally unstable, potential neurotics, potential delinquents, and those who suffer or have suffered from incontinence.

As might be expected, there were foster homes that proved to be unsuited for children, even though it appears that a large majority of foster parents strove to do their best. From interviews with parents of 150 children from 131 homes who had returned to London from Cambridge (**62**), it appeared that about four-fifths of the children who returned during the first 6 months after initial evacuation did not go home mainly because of dissatisfaction with the foster home, but for other reasons. Burt (**18**) has discussed a number of characteristics that should be taken into account in appraising a prospective foster parent. In one of the two groups

of children studied in the Cambridge Survey (**79**), there was a higher percentage of unsatisfactory adjustment in homes where the mothers were over 60, but this was not borne out by the other group.

Influence of Background and Other Factors on the Adjustment of Evacuees. Various studies indicate that children who showed a history of poor adjustment prior to the war or prior to evacuation tended to exhibit more unhappiness and maladjustment when evacuated than did children with a favorable past history (**17, 29, 62, 65**). In an account of a sampling of 46 of the Cambridge evacuees who were rated as unsatisfactorily adjusted to their foster homes (**62**) and of 40 children rated as satisfactorily adjusted, it appears that the incidence of unsatisfactory adjustment was decidedly higher in the case of children suffering from personality difficulties that did not originate with evacuation, but there also were cases of unsatisfactory adjustment among youngsters who had a favorable history, and some youngsters who had earlier exhibited emotional difficulties managed to adjust satisfactorily in the new situation. The Cambridge investigators conclude that there is every prospect that a child who is normal, friendly, and genial will, in his own good time, adjust well to billeting; that the child who is quiet and withdrawn, whether normal or abnormal, will become a welcome guest; while the child who shows active outgoing, aggressive qualities will tend to remain a problem for foster mothers and billeting authorities.

Findings with regard to the relation of intelligence to adjustment in the new home are inconclusive (**62, 65, 112**). John (**65**) found that the brighter children in her preschool group seemed to be more sensitive than the duller ones to the change and all its concomitants.

Effect of Presence of .Oher Children. Findings vary somewhat on the question as to the effect of the presence of other children in the home on the adjustments of evacuees. In the Cambridge study (**62**), the per cent of satisfactory adjustment in four combinations including the presence of siblings with or without other resident or evacuated children was higher than in combinations that included no siblings. On the other hand, Davidson and Slade (**29**) found that children billeted in families with three or more children showed less satisfactory adjustment than children billeted in families with no children. In the Vernon study of adolescent girls (112), satisfactoriness of adjustment bore no significant relationship to the pres-

ence of siblings or local children in the foster home, but there was a higher percentage of unsatisfactory adjustment in homes with 3 or more other children than in homes with only 1 or 2 children or with no other children. On the basis of informal surveys, Burt (**19**) makes recommendations concerning the placement together of children with various characteristics.

Refugee Children

Wasserman and Resek (**114**), in a study of refugee children living in the United States, report that a child's experience prior to his expatriation (whether or not he has been exposed to direct persecution, to bombing, or invasion, etc.) may have an important bearing upon his adjustment as a refugee. The adjustments of refugee children may also be complicated by difficulties which their parents meet in adjusting to a new life. They comment also on the remarkable "elasticity of the normal child's mentality enabling him to sever ties with the old and to adopt the new in a manner that adults may regard as lack of loyalty, but which is actually merely the healthy reaction of the young to a new experience." The authors also report that "almost all" refugee children like their American teachers in schools. Plaut (**94**) discusses the adjustments of refugee children in England.

An interesting supplement to the study of effects of evacuation on children should come when further systematic reports are available concerning the adjustments of refugee children who face a situation which in some ways resembles and in other ways is quite different from the situation confronting an evacuee.

Various Dislocations in Family Life and in Everyday Activities

Numerous reports deal with a variety of practical dislocations of everyday life entailed by the war (**4, 14, 23, 34, 46, 47, 61, 77, 83, 84, 88, 93, 97, 100, 103, 106, 110, 113**) including those arising in the home by virtue of the absence of the father or outside employment of the mother, or by reason of migration, congestion of population, and the like. According to various informal sources of information, it appears that the care of children whose mothers are working constitutes a serious problem in many sections of the country.

Parental fatigue and overwork may present complications. In a report on health conditions in England, Hill (**60**) alludes to a

Gallup survey (original report not seen by reviewers), according to which the proportion of people who said they slept more than 8 hours a night fell from 48% to 18% between April, 1939, and January, 1941. Rationing, food shortages, and various inconveniences undoubtedly in many instances have caused adult impatience with consequent effects on children. Of incidental interests here is a comment on the shortness of temper exhibited by German adults after two years of war (**99**). Blackouts and dimouts entail many obvious inconveniences and also certain dangers, such as an increase in road accidents (**111**). Stott (**106**) in a study of Nebraska farm families found that two-thirds of the farm women did "chores usually done by men and boys" as compared with a little over half the women in the prewar year. The reported average amount of time spent by mothers on outside chores was 1.63 hours per day in 1942 as compared with an average of 1.09 in 1941. Reports from 457 farm youths in the age range from 13 to 22 years indicate that there was an increase in parental worry and nervousness in 1942 compared with 1941, a decline in irritability and conflict in the family, a slight increase in "good times at home" and a sharp decrease in "family recreation outside the home."

Among other problems are those arising through shortages of well-trained teachers in some areas; and the assignment of teachers to subjects in which they are not fully competent. The assignment of many teachers to responsibilities connected with care of children during non-school hours presents both problems and opportunities.

Responses to Alarms, Air Raids, Bombing and Other Violent Impacts of War

In appraising reported findings on the effects of bombing and air raids, it is important to note whether the investigator is giving an overall view of the reactions of children in general, or is discussing the behavior of a select group of children, or is describing in detail the sufferings of children who have been seriously affected. It is important also, as Glover (**46**) stresses, to take account of the situation that confronted the individual at the time of the raid. In a heavily bombed city or countryside, all inhabitants will have had experience with the physical realities of air attack, but these realities will vary in the case of different individuals. The effects of raids may vary also in different popula-

tions, and at different periods within the same area in relation to factors such as war fatigue, hunger, reports of casualties, optimism or pessimism concerning the larger outcome of the war.

The effects of the explosion of a bomb in near proximity have been described by several writers, primarily on the basis of observations of the reaction of adults (**3, 25, 34, 46, 50, 54**). The immediate reaction in extreme cases may range from a coma-like daze to confusion, and delayed reactions may involve symptoms such as hyperactivity and agitation, or sluggishness, depression, difficulty in initiating voluntary activity, etc.

In many cases the impact of bombs and the fear of death are less disturbing than the darkness, dust, blood, and glass, the loss of moorings, the dislocation of everyday affairs, the tremendous inconvenience wrought by destructive raids, and the effects of loss of sleep and of extreme fatigue (**50**). Glover (**46**) also notes that in heavily raided areas a frequent response is anger, directed at local or central authorities more than at the enemy.

One source of strain, at least in adults, is anticipation of bombing, coupled with fear of the unknown and unpredictable, which may be more trying than the actual attack (**113**). It has been observed that habituation or acclimatization operates strongly, at least in the case of adults (**113**). This was also noted in the war of 1914–1918 (**119, 120**). There is a question as to whether apparent habituation represents greater imperviousness to fear or greater capacity for maintaining an appearance of calm.

Large-scale surveys, of a more or less systematic nature, of the reaction of the population in "blitzed" areas, indicate that in the case of children and adults the psychological effects of air raids have not been as severe as anticipated. Although observers do not agree with respect to the incidence of marked emotional disturbances, most of them agree that only a small per cent of physically unhurt children have shown notable overt after-effects. On the other hand, studies also reveal that there are children who have been seriously disturbed and, although these may constitute a small percentage, they still, in the aggregate, represent suffering on a large scale. Moreover, some writers are of the opinion that many children have suffered in ways that do not appear on the surface and that are not recognized by parents and teachers, or have sustained shocks that may lead to neurotic behavior at a future time.

On the basis of reports from psychologists and doctors in

Great Britain, many of whom were located in areas that had been raided, Vernon (**113**), in an article devoted mainly to adult reactions, comments with respect to children that "all observers seem to agree that the raids had even less effect on children than upon adults." Moreover, he states that the novelty and social activity of shelter life appealed to many children, at least for a time. Even when bombed out of their homes, children have frequently been found playing happily the next day. Kimmins (**72**) reports impressions gained from children's essays written after air raids in the war of 1914–1918. In several other reports from the war of 1914–1918, observers make the point that children as well as adults showed a considerable degree of calmness, or adjusted quickly to the raids, or made efforts not to betray fears that might prevail (**119, 120, 129**). On the other hand, one observer (**74**) notes that Zeppelin raids on London had a decidedly disturbing effect on a group of crippled children, and the removal of children from raided areas was recommended by some writers (**74, 125**).

It is interesting to note that in the writings dealing with response to bombing in the war of 1914–1918, there seems to be more implicit approval or admiration of absence of cowardice and of efforts to make a brave front than in the contemporary literature. In the latter, writers seem to be relatively more concerned about inner tensions, whether or not they are displayed overtly.

Henshaw and Howarth (**58**), in reporting a number of impressions gained through observation and study of children who had been subjected to bombing in various localities, indicate that the proportion of children who show overt fear of raids, or manifest obvious after-effects, is small compared with the total number of children who have been exposed; but while the number of cases that are seriously affected may not be large, many of these cases are not being recognized. The view that many adult disorders have been unrecognized has been voiced by several writers (**25, 34, 46, 54, 75, 91**), who urge caution in interpreting statistics from mental hospitals which indicate that the number of new admissions attributable to the war has been quite small (**6, 12, 52, 56, 93**).

In a report of observations concerning the effects of air raids during the Spanish Civil War, Mira (**85**) states that the raids did less damage than was popularly believed, and that the effects of bombing were less severe than the effects of slow starvation. Mira reports that on the whole children were more tranquil than the adults during air raids. This report gives a more optimistic

picture than an earlier account by Langdon-Davies (**76**) of behavior which he had observed during raids on Barcelona.

In a survey of 8000 Bristol school children following heavy raids in that city, Dunsdon (**34**) found that 300, or about 4%, of the 8000 children who were in the city at the time of bombings showed signs of strain; 120 of these showed psychological symptoms such as nervousness, trembling, aggressiveness, and crying. These symptoms appeared more frequently among children aged 5 to 7 years than among children 11 years or older; the latter tended more frequently to show psychosomatic symptoms such as headaches, indigestion, pallor, anorexia, nosebleeding, and incontinence.

Some observers have noted children tend to have difficulty in concentrating during periods immediately following an air attack, and that many children tend to exhibit tensions through signs such as boisterousness, loud talk, restlessness, or a disposition to argue more than usual (**12, 16, 34, 58, 132, 139**).

A young child may be quite affected by the intense emotional reactions exhibited by his elders (**65**). It has also been noted, however, that children near or at the teen age may be challenged by the emotional distress shown by a parent or other adult and seek to give help or reassurance (**72**).

In the present war, there are several reports of severe psychological disturbances exhibited by children, especially in heavily raided areas. Acute symptoms of distress have been described in a review of Woltman (**16**) of observations reported by Brander, and in a report, (not seen by the present writers) by Birk (**11**).

In a study of preschool children who had been in bombed areas before their evacuation, John (**65**) noted after-effects in some youngsters six months after the bombing. Sixteen of the children who had experienced air raids showed "abnormal" fear of noises before the raid and before evacuation, as compared with 42 showing such fears after the raids; there was a rise from 16 to 26 in the number of cases that showed fear of the dark before and after the raids. These results perhaps are influenced not only by the raid itself, but also the subsequent evacuation.

John noted that after-effects bore a higher relationship to the amount of fear shown at the time of the raid than to the severity of the raid itself, and the degree of fear manifested by the child seemed in many instances influenced by the degree of fear shown by the child's mother. On the basis of computations which are

not fully described, John reports a correlation of .59 between mothers' and children's fears at the time of the raid. Solomon (**101**), in an account of the reactions of San Francisco children to an air raid alarm soon after the attack on Pearl Harbor also noted that a prominent feature in the reaction of children was the contagion of anxiety from adults.

Bodman (**12**) reports a study of children aged 2 months to 12 years who several months earlier had been subjected to a terrifying air raid experience while they were patients in a hospital. Of the 54 children in the bombed group, 51 were traced; of these, 44 were alive, the others having died of various illnesses. Five of the youngsters, or 11%, still showed symptoms attributable to the experience and, according to the parents, 27, or 61%, of the children had shown distress during periods ranging from one or two weeks to two months after their return home from the hospital—manifesting symptoms such as sweating when the siren sounded, or showing fright. Bodman describes the subsequent reactions of children at various age levels.

Mons (**87**) asserts that "even a single 'harmless' air raid can do great damage to a child's psyche, be he ever so 'normal' and 'fearless' on the surface," and that children may be subject to disturbing after-effects which parents and teachers fail to see. Mons (**87**) and Alcock (**2**) report that Rorschach responses of children who have been bombed reveal disturbances in "deeper layers of personality" to a greater extent than the responses of unbombed children.

There are recurrent observations to the effect that those who show pronounced disturbances precipitated by the war, whether they be children or adults and whether the reaction be in response primarily to bombing or evacuation or other events, are in a large proportion of cases persons who had an earlier history of psychological or behavior disorder (**37**, **49**, **56**, **57**). The generalization thereby implied seems to be reasonable enough, yet it does not mean, of course, that all children who have a history of emotional difficulty will succumb to wartime stresses or that all children who have a favorable history will be immune to an especially trying ordeal. Adequately to establish the relation of wartime emotional disorders to prewar personal maladjustments would require more systematic study by the control-group procedure.

In several writings, dealing largely with adults, appear statements to the effect that the effort to keep a brave front and to maintain self-control over internal thoughts and feelings evoked

by the presence or anticipation of danger may aggravate the stress that is endured. According to Rickman (**96**) this effort may even eventually have as much of an unnerving effect as the dread of danger itself. Wilson (**116**) maintains that admission and acceptance of fear is a safeguard against breakdown.

Such pronouncements take on added interest in connection with the problem of children's anxieties and fears as affected by the behavior of adults: it would seem that exhibition of fear by an adult may have an unfortunate effect on children, while an adult's readiness quietly to admit and accept his fear might still have value for him.

Various writers have commented on the bracing effect of having a job to do (**44, 46, 50, 69, 113**). Vernon's correspondents indicate that, among other matters, lecturing to a class of students may be helpful, at least to the lecturer While these observations deal with adults, they also seem pertinent as regards children. As mentioned in an earlier section, children themselves have expressed a desire for more constructive participation in the war effort.

Delinquency

A report issued by the British Information Services (**135**). shows an increase of about 33% in the number of children aged 8–16 who were charged with indictable offenses during the first 12 months of the war, as compared with the previous 12 months of peace. The second 12-month period showed an increase of 52%, and the 4-month period from September through December, 1941, an increase of 38% over the corresponding peacetime periods.*

The percentage of increase is more arresting when computed in terms of the delinquent population, as above, than when computed on the basis of the total child population (as of 1938). In the age range from 14 to 16 years, for example (the range showing the highest rate), there was a rise in the rate of indictable offenses from 11 per thousand boys in the last year of peace to 16 per thousand in the second year of war. In the case of girls, there was a rise from .8 to 1.9 indictable offenses per thousand of girls during the same period. Such increases certainly represent a serious matter, yet one might comment that the wonder is not that there has been an increase but that the increase has been so small.

* According to a press report appearing after this article was prepared, there was a decline in delinquency in England in 1942 as compared with 1940–41 (*New York Herald-Tribune*, Aug. 22, 1943).

Statistics with regard to the nature of the illegal acts that were committed indicate that many of the offenses could hardly be considered serious acts of delinquency in the usual meaning of that term, at least under peacetime conditions.

From many quarters come reports of an increase in delinquency in this country since the outbreak of the war (**47**, **128**). The materials are not such that they can be summarized in a single, all-over statistic.

A report issued by the New York State Department of Social Welfare (**131**) on December 2, 1942, indicates that in 13 "war-industry counties" delinquency cases disposed of by children's courts increased 11.5% in the first 6 months of 1941, and 22.4% in the first 6 months of 1942, over the average for the first 6 months of 1938–1940. On the other hand, in 39 counties not classified as war-industry areas, there was only a slight increase of .8% in 1941 and a decrease of 2.2% in 1942.

There were many more or less obvious factors that have been mentioned as contributory to juvenile delinquency during war, in addition to the many complex factors that contribute to delinquency in times of peace (**13**, **34**, **51**, **82**, **90**, **127**, **128**).

Vital Statistics, Health, Effects of Malnutrition

Birth Rate and Infant Mortality. A declining trend in infant mortality rates in many countries for several decades prior to 1914 (**103**, **115**, **137**) was interrupted or reversed in several European countries during the war of 1914–1918 (**102**, **115**). The decline was resumed thereafter, and then, according to provisional statistics, again was interrupted or reversed in some countries, but not in all, during the first two years of the present war (**111**, **127**). The declining birth rate trend prior to the war of 1914–1918 was accelerated in belligerent countries during the war years (**78**, **137**). There was a rise in the birth rate following the armistice, but by 1920–1922, the downward trend had been resumed again (**137**). Birth rates during the first full year of the present war have shown a decline in several countries, but the statistics are not definitive.

From various sections of the United States come reports of a recent increase in the birth rate. Provisional data indicate that the birth rate in New York State in 1941 and in the first 9 months of 1942 was higher than the average from 1936 through 1940. The sharpest gains on the basis of reports at hand (through October, 1942) occurred during September and October, or 9 and 10 months after Pearl Harbor (**130**). Undoubtedly many factors, in-

cluding an increased marriage rate, have contributed to these short-term trends so far reported. During the early period of the war of 1914–1918 there was a "sudden and phenomenal rise" in the number of marriages in England (**138**), followed by a decline to below the average marriage rate on the third quarter of the second full year of war. Trends in marriages and birth rates during the present and the last war have been discussed by Bossard (**14**) and Stocks (**104**).

Child Welfare Activities. The attention which war focusses upon birth and infant mortality rates is part of a larger picture of accelerated or augmented interest in social welfare which was noticeable in some countries in the last war and is conspicuous also in the present war. Indeed, by reason of steps taken to protect and safeguard the civilian population, a condition of warfare, short of devastating bombing or invasion, may, at least for a time, result in improvement of health and nutrition in certain areas. Among the child care facilities that have been provided or have been augmented are nursery schools, day nurseries, maternal health centers, play centers, camps and hostels, machinery for instruction in nutrition, health, and other aspects of child welfare, and machinery for providing supplementary feeding, free lunches, and the like (**21, 30, 31, 63, 70, 118, 124, 126, 133, 136**).

Health, Nutrition, Physical Impairment. It will not be possible until after hostilities are over to make anything approaching a systematic appraisal of the extent to which the child population, especially in invaded or occupied areas, has suffered from malnutrition and disease, or to appraise the long-term after-effects of wartime deprivations.

Reports from England indicate that while gains in public health provisions have rendered the British population better equipped this time than in 1914 to stand the physical strains of war (**59, 60**), the child population is not fully immune to the stresses of wartime, as indicated in reports that in various localities there has been an increase in the incidence of tuberculosis (**27, 81, 105**) since the beginning of the present war and that school children in some areas have shown signs of malnutrition (**28, 80**).

Reports concerning conditions in Germany following the war of 1914–1918 (**36, 55, 67**) indicate that children in many localities were markedly underweight and also failed to make normal gains in height. Other evidences of malnutrition included considerable tooth decay, prevalence of rickets, skin disorders, and other conditions associated with undernourishment. Undoubtedly there

were areas in the last war (such as in Serbia) in which children suffered even greater hardships.

Some Psychological Effects of Malnutrition. According to several writers, one conspicuous effect of malnutrition on behavior appears in the form of apathy and listnessness (**38**, **39**, **55**, **121**, **122**). Children have been described as showing lack of energy for play, a lack of gaiety, difficulty in concentrating on school work and loss of memory of what has recently been learned. Disturbances due to lack of food are mentioned as being especially noticeable in malnourished adolescents. One observer stresses the difficulty that adults may experience in making decisions in everyday affairs. The reviewers have not located any systematic study which shows the range and incidence of various symptoms such as the foregoing in relation to malnutrition of varying degrees and duration. In some reports that deal at length with physical symptoms, psychological reactions are mentioned only in passing, if at all. One writer (**55**) reports that children who showed symptoms such as those described above rapidly became cheerful and strong when they received proper nourishment, but there seems to be no systematic study of the rate and course of psychological recovery and of possible unfavorable after-effects.

Interesting to students of child development is the question as to what, if anything, is the effect on the child of being born to a mother who, in spite of special provisions for pregnant women, is physically less robust by reason of wartime deprivations, complicated by emotional disturbance occasioned by the absence of the husband, and the dangers and uncertainties of the times. A report from Germany following the war of 1914–1918 (**36**) sets forth that less than 50% of the mothers in some areas were able to nurse their babies, and that most of the mothers who could nurse had a reduced supply of milk and were unable to continue beyond a few weeks. If there is anything to the theory that the experience of nursing has psychological values beyond food-getting, and that the mental state of the mother may have profound effects on the infant, one might conjecture that the basis of later neuroses was being established in many children. The reviewers have found no systematic follow-up studies bearing on this and related problems.

Concluding Comment

As has been suggested above, the literature concerning the impact of war on children contains a decidedly larger volume of pronouncements than of reports of systematic, scientific data. In

some writings, it seems that the authors have used the occasion mainly to reiterate peace-time theories. Moreover, authoritative information from many of the sections of the globe that have felt the war more severely than England is quite limited.

There is a lack of comprehensive evidence not only concerning the immediate psychological and physical effects of war at its worst, but also, unavoidably, concerning residual effects in the form of physical impairment, neurosis, and fears and hatreds that might have an influence on attitudes and behavior in future years. Future research will perhaps also give more systematic information concerning the extent to which children at various levels of maturity can participate in efforts such as those which a war entails, and the effect of such participation on children themselves. A further interesting subject for inquiry is the influence that happenings such as large-scale migrations of people, the opportunity for rural and urban populations of varying cultural and socio-economic backgrounds to rub elbows with one another, and the establishment of extensive public facilities for the everyday care of children might have on education and child welfare arrangements in the future.

Although observers disagree in their estimates of the effects of bombing, evacuation and other impacts of war, the major finding that seems to emerge from England at this juncture, both from several systematic studies and from the testimony of historical events, is that the child population has been able to face the strains of total war with a great degree of emotional hardihood and adaptability. The youngsters who have clearly shown marked or persisting emotional disorders, or neurotic or delinquent behavior represent a relatively small proportion of the child population. However, the testimony of events and limited findings from other quarters indicate that all civilian populations have not uniformly been able to "take it" as well as did the people of Great Britain when that country stood on what seemed to be the brink of disaster after the fall of France. Apparently, in addition to the factor of the severity of the physical ordeals that may be involved, there are many unexplored psychological factors, some of which we now lump loosely under the general heading of "morale," that have played an important role.

The findings that so far have accumulated support or supplement generalizations that have emerged from many peace-time studies, including studies of the development of children's concepts and attitudes; the bearing of physical well-being upon psy-

chological stamina; the importance of family ties not only in relationships between parents and children but also in relationships between brothers and sisters; the influence of parental emotional reactions on the reactions of children; the bearing of the adequacy or inadequacy of past adjustments upon the ability to adjust to new or trying situations, with the reservation that a new ordeal may reveal previously unsuspected weaknesses or prove to be so severe as to overwhelm a person who hitherto had a favorable history.

It can hardly be said that studies that have been completed to date have produced new light in which to study children or in which to interpret what we already know about them. To change the figure, the new wine has been collected in the old bottles of psychological theory. This perhaps is inevitable since war between nations involves a continuation of conflicting forces that operate in human behavior during times of diplomatic peace. It is possible, however, that as research findings accumulate, new insights might emerge concerning children's limits of endurance and capacity for recuperation, the physical and psychological influences in the environment which strengthen their fortitude or facilitate their collapse, and the possibility of mobilizing, for peaceful purposes, potentialities for the development of emotional attachment to values and positive ideals which, on critical occasions in the present war, have proved to be stronger than the forces of anger or cupidity, and more powerful than fear.

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PROCEEDINGS OF THE FOURTEENTH ANNUAL MEETING OF THE EASTERN PSYCHOLOGICAL ASSOCIATION

THEODORA M. ABEL, SECRETARY, LETCHWORTH VILLAGE

The Fourteenth Annual Meeting of the Eastern Psychological Association was held at Hunter College, New York City, on April 30th and May 1st, 1943, under the auspices of the Department of Psychology and Philosophy of Hunter College. During the winter the officers of the Association made careful inquiry of the Office of Defense Transportation and decided that holding of the meetings was in accordance with the directives of that office. In order, however, to avoid any radical departure from the policy established by the Office of Defense Transportation as regards long distance traveling, the officers of the Association deemed it advisable to ask members living more than one hundred miles from New York City to absent themselves from the meetings unless: they were officers of the Association, they were presenting papers and participating in round tables; they had immediate interest in those portions of the program dealing with war problems; or they were coming to New York on some war business, anyway, at the time of the meetings. In spite of the restriction, attendance at the meeting was 420; 193 members, 28 applicants for membership in 1944, and 199 guests.

The exigencies of the present war situation made the work of the Program Committee somewhat more hurried and less thorough than is sometimes possible, especially as final decision to hold the meeting was not made until the middle of February. A program of thirty-six papers, three round tables, and three films was made up from the abstracts submitted; and a special panel discussion on Psychology and the War was borrowed intact from the program for the canceled meeting of the American Psychological Association. Several expected participants in this program were absent due to pressing war duties but a sufficient number did present reports to justify devoting the whole Saturday morning program to them. These panels gave members and guests of the Association an excellent opportunity for obtaining first-hand information about actual work being done by psychologists either on committees of the National Research Council, in government agencies or in the armed forces. It was of particular interest to find out that psychologists working with the armed forces not

only study methods of selection but are definitely contributing to the training program as well. In order to interfere as little as possible with week-end transportation facilities, no general session for Saturday afternoon was scheduled.

No presidential dinner was given this year. At an evening session Friday, Gardner Murphy introduced President George N. Shuster of Hunter College, who welcomed the Association to the College, and Gordon W. Allport, president of the Association, who spoke on "The Ego in Contemporary Psychology." The President classified and reviewed various definitions of the ego as employed by psychologists since psychology came into "its own" as a science. He gave evidence pointing to the fruitfulness of making use of the ego concept in explaining and interpreting of data obtained from experimental and empirical procedures in various fields of psychology. The speech was concluded by the prediction that "ego-psychology in the Twentieth Century will flourish increasingly. For only with its aid can psychologists reconcile the human nature that they study and the human nature that they serve."

Elections and Appointments: Officers were elected to serve as follows: *President*, 1943–44, Edna Heidbreder, Wellesley College; *Secretary*, 1943–46, Theodora M. Abel, Letchworth Village; *Directors*, 1943–46, Gordon W. Allport, Harvard University, and Henry E. Garrett, Columbia University; *Director*, 1943–44, to fill the unexpired term of Edna Heidbreder, Donald G. Marquis, Yale University. The Board of Directors appointed as members of the Program Committee, Edward Girden, Brooklyn College, 1943–46, and J. McV. Hunt, Brown University, 1943-44, to fill the unexpired term of J. J. Gibson resigned; as representative on the Council of the American Association for the Advancement of Science, 1943–45, Harry Helson, The Foxboro Company; and as the Auditing Committee, Bernard F. Riess and Livingston Welch, Hunter College.

The following actions were taken at the annual business meeting:

(1) Proceedings of the 1942 Meeting as printed in the *Psychological Bulletin* were accepted.

(2) The reports of the Secretary and of the Treasurer were accepted and a budget totalling $695.00 was adopted for the year 1943–44.

(3) Fifty-eight applicants for membership were taken into the Association on recommendation of the Board of Directors.

(4) It was voted to reconstitute the Clearing House of Information relative to job placement with the Secretary as chairman and with three

other members geographically distributed to be appointed by the incoming President to cooperate with the Office of Psychological Personnel or give placement service as seems best in their judgment.

(5) The invitation of President Marsh and the Department of Psychology of Boston University for the Association to hold its annual meeting in 1944, at that institution was accepted with thanks but was made subject to the rules and conditions that the Office of Defense Transportation might make.

(6) The following resolution presented by Gardner Murphy was unanimously adopted:

Whereas we, members of the Eastern Psychological Association, have confidence in the scientific integrity and professional competence of Goodwin B. Watson, and in the value of his present work as analyst for the Foreign Broadcast Intelligence Service;

And whereas, we regard him as a loyal citizen of the United States and not subversive in either speech or conduct;

And whereas, in our opinion he has been during the past months, wrongly accused and misrepresented by the Dies Committee, and more recently has received an inadequate hearing before the Kerr Committeee;

And whereas, we are aware of the danger resulting from this situation for the freedom of other scientists to make their contribution to public welfare as employees of government bureaus;

Be it resolved, that we deplore any political persecution of civil servants, and call upon our Representatives and Senators to see that the American tradition of fair play is upheld, and that Dr. Watson be given a truly adequate hearing, or that the charges against him be dismissed.

Be it further resolved, that this resolution be inscribed in the minutes of the annual meeting of this Association, and that copies be transmitted to the members of the United States Senate, to members of the House Appropriations Committee, and to representatives of the press.

(7) A resolution thanking the Local Committee, President Shuster, and the administrative officers of Hunter College, for their kind hospitality and excellent arrangements made for the meeting of the Association in spite of unexpected emergencies and the handicaps of time and space, was unanimously adopted.

The financial statement for the fiscal year, 1942–43, prepared by the Treasurer and verified by the Auditing Committee is as follows:

FINANCIAL STATEMENT AS OF MAY 1, FOR THE FISCAL YEAR 1942–1943

Income

Membership Dues		
Dues for current year (1942–43)	$ 434.00	
Applicants' fees	58.00	
Arrears	135.00	
Advance payments for 1943–44	4.00	
Guest Fees	199.00	
Interest on savings account	24.78	
Total Income		$ 854.78

Expenditures

Publication of 1941–42 *Proceedings*	$ 39.20	
Office of the Secretary	179.75	
Office of the Treasurer	155.00	
Travelling expenses of officers	13.52	
Program Committee (1941–42)	35.10	
Program Committee (1942–43)	14.14	
Printing, mimeographing	88.29	
Miscell. stationery, supplies, expenses (Secretary)	27.35	
Postage (incl. stamped envelopes)	54.47	
Refund of Dues (excess payment)	1.00	
Bank charges—collecting Money Orders	.90	
Local expenses, Hunter College meeting	74.07	
Total expenditures		$ 682.79
Surplus for 1942–1943		$ 171.99

Balance Sheet

Cash: Fifth Avenue Bank of N. Y.	$ 710.34	
New York Savings Bank	1266.25	
Petty Cash: Secretary	20.00	
Petty Cash: Treasurer	20.00	
Total Cash		$2016.59
Capital: As of May 1, 1942	$1844.60	
Surplus, 1942–43	171.99	
Total Capital		$2016.59

The program of the meeting was as follows:

CLINICAL PSYCHOLOGY

EDGAR A. DOLL, Chairman

On Lefthandedness and Stammering. ALICE FRIEDMANN, New York City.

A Psychometric Pattern of the Adolescent Psychopathic Personality. JOSEPH LEVI, Bellevue Psychiatric Hospital and New York University.

Tests of Recent Memory in the Measurement of Intellectual Deterioration. S. MEDFORD WESLEY, Yale University.

Ecology of Mental Illness in Eastern Connecticut. RICHARD C. DRAPER, U.S.B.A.E. and FLORIEN HEISER, Norwich State Hospital.

A Comparative Study of Mental Functioning Patterns of Problem and Non-Problem Children Seven, Eight, and Nine Years of Age. MYRTLE LUNEAU PIGNATELLI, Bellevue Psychiatric Hospital.

EDUCATIONAL PSYCHOLOGY

JAMES M. O'GORMAN, Chairman

The Age Factor and Form of Instruction in Search. HOWARD L. KINGSLEY and HARRIETTE BOWERS ANKENY, Boston University.

Generalization of the Concept of Middleness. VIRGINIA H. GRAHAM, Institute for Research in Child Psychology, Hunter College.

Cooperation in Problem Solving. SAMUEL F. KLUGMAN, University of Pennsylvania.

Some Points of View Preferred by Instructors in Mental Hygiene. NINA RIDENOUR, New York City Committee on Mental Hygiene of the State Charities Aid Association.

Student Attitude as a Factor in the Mastery of Commercial Arithmetic. ALBERT L. BILLIG, Allentown, Pennsylvania.

The Prediction of Success in an Engineering Curriculum. JAMES M. PORTER, JR., Carnegie Institute of Technology.

LEARNING

LOUIS W. MAX, Chairman

An Experiment on Incidental Memory. MARTIN SCHEERER, College of the City of New York.

The Relative Difficulty of Morse Code Characters Learned by the Whole Method. S. D. S. SPRAGG, Queens College.

An Experimental Comparison of Code-Learning Methods. JOHN P. SEWARD Connecticut College.

The Effect of Interpolated Activity on Recovery from Experimental Extinction. ALVIN M. LIBERMAN, Yale University.

Effects of Phenobarbital on Learning and Retention. MARSHALL R. JONES, Cornell University Medical College and the New York Hospital, and CAROLYN EWERS JONES, New York City.

The Insulin Effect on Learning in the White Rat. BERNARD F. RIESS, Institute for Research in Child Psychology, Hunter College, and LOUIS BERMAN, New York City.

The Influence of Nutritional Deficiencies during Pre-Natal Life on the Development of Psychological Capacities. GEORGE L. KREEZER, Cornell University.

EDUCATIONAL PSYCHOLOGY AND MEASUREMENT

HENRY E. GARRETT, Chairman

The Measurement of Judgment. LIEUTENANT FREDERICK B. DAVIS, The Avon School (on leave).

An Instrument for Measuring Attitude Toward Factors Important in Traffic Safety. ELMER B. SIEBRECHT, New York University. (Introduced by B. E. Tomlinson.)

A Binocular Reading Test. GEORGE SPACHE, Friends Seminary, New York City.

A Factorial Study of Achievement in First Semester College German. J. RICHARD WITTENBORN, Yale University, and LIEUTENANT (j.g.) R. P. LARSEN, U.S.N.

The Emergency Use of Wechsler-Bellevue Subtests. ALBERT I. RABIN, New Hampshire State Hospital.

A Comparison of Dexterity Ratings on Usual Dexterity Tests with the Dexterity Ratings Made on a Meaningful Task. MARION STEEL, BENJAMIN BALINSKY, and HAZEL LANG, Vocational Service for Juniors.

SOCIAL PSYCHOLOGY

GARDNER MURPHY, Chairman

Attitudes Toward Peace and War in a Sampling of College Men. VERNON JONES, Clark University.

Impact of War on a Nationalistic Frame of Reference. CHARLES E. OSGOOD, Yale University.

On Which Side is History? S. FELDMAN, Cornell University.

The Identification of One's Own Handwriting. STEUART HENDERSON BRITT, Office of Psychological Personnel, National Research Council, and IVAN N. MENSH.

Understanding versus Suggestion in the Social Field. S. E. ASCH, Brooklyn College.

Different Responses Produced by Good and Poor Art. CATHARINE PATRICK, New York City.

PERSONALITY

PERCIVAL M. SYMONDS, Chairman

A Further Experimental Investigation of Projection. LEOPOLD BELLAK, College of the City of New York, and N. Y. Medical College and Fifth Avenue Hospitals.

Intelligence Quotient (I.Q.) and Rhythmical Quotient (R.Q.), an Experimental Approach to Children's Personality Organization. WERNER WOLFF, Bard College, Columbia University.

Children's Choice of a Different or an Easy Route to a Goal. IRWIN L. CHILD, Yale University.

Adult Leadership as Related to the Bernreuter Personality Measures. NELSON G. HANAWALT and HELEN M. RICHARDSON, New Jersey College for Women.

Mental Decline and Its Retardation. GEORGE LAWTON, New York City.

Two Decades of Centenarians. GRACE E. BIRD, Rhode Island College of Education.

ROUND TABLES

Psychological Analysis of the Authoritarian Character Structure. A. H. MASLOW, Chairman. Participants: RUTH BENEDICT, DAVID M. LEVY, GARDNER MURPHY, MAX WERTHEIMER.

Problems of Diagnosis and Prognosis in the Rorschach Method. BRUNO KLOPFER, Chairman. Participants: A. LOUISE COLLINS, M. R. HARROWER-ERICKSON, MARGARET R. HERTZ, L. G. HIRNING, Z. A. PIOTROWSKI.

Psychological Problems in the Housing of War Workers. J. B. MALLER, Chairman. Participants: A. GOLDFELD, J. ZUBIN, J. SEIDMAN.

FILMS

T. C. SCHNEIRLA, Chairman

The Effect of Infantile Feeding-Frustration on Adult Hoarding in Albino Rats. J. MCV. HUNT, H. SCHLOSBERG, R. L. SOLOMON, and E. STELLAR, Brown University.

Some Examples of Hypnotic Regression. PHILIP L. HARRIMAN, Bucknell University.

This Is Robert: A Study of Personality Growth in a Preschool Child. L. JOSEPH STONE, Vassar College.

PRESIDENTIAL ADDRESS

The Ego in Contemporary Psychology. GORDON W. ALLPORT, Harvard University.

PANEL DISCUSSIONS

Psychology and the War. Panel I. LEONARD CARMICHAEL, *Chairman*, National Roster of Scientific and Specialized Personnel. *Participants:* W. V. BINGHAM, *chairman*, Advisory Committee, Adjutant General's Office on Classification of Military Personnel; J. W. DUNLAP, *director of research*, Committee on Selection and Training of Aircraft Pilots; LT. COMMANDER J. G. JENKINS, U.S.N.R., Bureau of Aeronautics; R. LIKERT, Head, Division of Program Surveys, Bureau of Agricultural Economics, Department of Agriculture; W. R. MILES, Committee on Selection and Training of Aircraft Pilots and Committee on Aviation Medicine, National Research Council; M. S. VITELES, *chairman*, Committee on Selection and Training of Aircraft Pilots; R. S. WOODWORTH, *chairman*, Committee on Child Development.

Psychology and the War. Panel II. W. S. MILES, *Chairman*, Committee on Selection and Training of Aircraft Pilots and Committee on Aviation Medicine, National Research Council, acting as chairman for Major Karl M. Dallenbach. *Participants:* G. W. ALLPORT, *chairman*, Sub-Committee on Defense Seminars; E. G. BORING, *chairman*, Sub-Committee on Textbook of Military Psychology; ALICE I. BRYAN, Sub-Committee on Service of Women Psychologists in the Emergency, acting for Ruth S. Tolman; LEONARD CARMICHAEL, *chairman*, Division of Anthropology and Psychology; EDGAR A. DOLL, *chairman*, Sub-Committee on Problems of Mental Deficiency; C. C. PRATT, *chairman*, Sub-Committee on Psychological Research Projects.

PROCEEDINGS OF THE BAY AREA DIVISIONAL MEETING OF THE WESTERN PSYCHOLOGICAL ASSOCIATION

RALPH H. GUNDLACH, ACTING SECRETARY-TREASURER,
UNIVERSITY OF WASHINGTON*

The secretary-treasurer of the Western Psychological Association was called to the army in December, 1942, and his predecessor was asked to serve as temporary substitute.

The Executive Committee, after conferring with many members, agreed that there should be no coast-wise meeting of the Association this year. It was also approved that the present officers be retained until such time as a general meeting is held.

At the suggestion of the representatives in Oregon, it was recommended that regional meetings in the Northwest, the Bay Area, and in Southern California be encouraged. The Oregon psychologists urged this since, at the time of planning, there was presumably to be a meeting of the Pacific Division of the A.A.A.S. this spring at Corvallis, in which they wished to take part officially. That meeting was later cancelled. No meeting was held in Los Angeles for lack of interest.

The Bay Area meeting was held at the University of California on Saturday, June 12, 1943. About 50 persons registered for the meetings, a good many of those in attendance representing the armed services.

A special order of business came up with regard to the treatment by Congress of Dr. Goodwin Watson. A resolution in his support, urging that he be given a fair hearing, was passed.

Professor Calvin P. Stone summarized for the assembly those phases of the Intersociety Convention held in New York on May 28–31 which were not confidential.

The officers of the Association, elected last year and now continued in office, are: *President*, Jean Walker Macfarlane, Institute of Child Welfare, University of California; *Vice-President*, William Griffith, Reed College; *Secretary-Treasurer*, for a three year term, Lester F. Beck, University of Oregon.

* On leave and instructing at the University of California.

PROGRAM

Saturday Morning, June 12
ROGER G. BARKER, Chairman

Weight Illusions Induced by Cues of Low Probability. MAX LEVIN, University of California.

Extending a previous study by Brunswik, an inconsistent association (r .33) between position (right-left) and weight was found to induce a weight expectancy illusion. Presentation sequences consisted of relatively frequent, positive instances (200 vs. 50 grams) randomly interspersed with relatively infrequent, negative instances (50 vs. 200) and with pairs of equal weights (50–50 or 200–200). The latter also served as test cases for the effectiveness of the position-cue. From 72 subjects a "paradoxical" learning curve was obtained, rising rapidly until the 29th trial and declining slowly but significantly during the remainder of the 81 trials, indicating a "disappointment" with the cue. The results are independent of explicitly formulated hypotheses concerning the position-weight relationship. Further experiments are in progress to decide between the "relative frequency" and a possible "summation" interpretation of the results.

Factors Associated with IQ Changes in Children. KATHERINE P. BRADWAY, Stanford University.

One hundred and thirty-eight children who had been examined with the Revised Stanford-Binet Scale between the ages of two and five and a half years were located ten years later and re-examined with the same scale. The environments of fifty subjects for whom the critical ratios for the differences between initial and retest IQ's were 1.8 or higher were studied by the method of home interviews. A comparison of environmental factors of twenty-four subjects who had increased in IQ with those of twenty-six subjects who had decreased showed that the variable which was most closely related to direction of IQ change was an ancestral intelligence index based on the intelligence of the parents and grandfathers of the children.

Personality Correlates of Morale: Evidence from Individual Cases. R. NEVITT SANFORD, University of California.

Harding's "Scale for Measuring Civilian Morale," and a comprehensive, specially designed questionnaire were administered to 100 men and 173 women at the University of California on December 4, 1941. A previous paper reported statistical relationships between "morale" score and a variety of personal and social characteristics. The present paper presents two cases—the one a high morale case and the other a low morale case—and seeks to expose the patterns of factors responsible for the differences in morale. With respect to social factors and superficial aspects of behavior the two cases are similar; with respect to certain deep-lying personality factors which seem to have originated in family relationships,

they are markedly different. These differences, it is argued, are mainly responsible for those differences in social and political sentiments reflected in the divergent morale scores.

The Use of a Group Projective Technique in Comparing High School Groups With Different Social Backgrounds. HAROLD KELLEY, University of California. (Introduced by Ralph H. Gundlach.)

Responses to six story topics were obtained from groups which differed in age, sex, nationality, and socio-economic level. The topics were directed toward a projection of ambitions, admiration for an adult, worries, and personal, social, and family difficulties. Significant sex differences were found between the ambitions attributed to the story heroine. The boys represented her as desiring a home and family; the girls gave her a career. In descriptions of a highly admired man, fame became increasingly important in the lower socio-economic and ethnic groups. A significant negative correlation was obtained between dominant and nurturant behavior assigned this hero. Dominance tended to become more important and nurturance less important at the older age level for the Chinese groups. The opposite trend was found for upper class white groups. Significantly more family difficulties were described by the girls and more social difficulties were described by the older groups.

The Morale of Shipyard Workers. RALPH H. GUNDLACH, University of Washington.

This is a preliminary report based upon questionnaires and detailed personal interviews. Two-thirds believe that promotions come through pull and rarely through sheer merit; production is thought to be very inefficient; 40% feel with resentment that many men are idle or are kept doing and undoing useless things.

Bad morale is reflected in low output, high turn-over and absenteeism. Workers have little knowledge of the Nation's major goals; they have little sense of participation or belonging, of cooperating in a mutual job; they are confused by being treated publically both as production heroes and as racketeering loafers.

Introduction of the principles of civilian morale building would increase per-man production 25 to 50%.

An Evaluation of Test Performances of a Group of Psychopathic Delinquents. ROBERT B. VAN VORST, Preston School of Industry.

This study was an attempt to discover how delinquent boys, who had been given the psychiatric diagnosis of 'psychopathic personality' would conform to the response patterns predicated as characteristic of their clinical group. The 1941 revision of the Wechsler-Bellevue Test of Intelligence and the 1942 Minnesota Multiphasic Personality Inventory were used. Results secured, while tentative, due to the relatively small number of psychopaths used, do not appear to support the claims of either of the tests, to an extent which would justify defining any characteristic response pattern for the psychopathic personality.

The Foetal Heart as a Responding Mechanism. DORIAN ROSE, University of California.

Foetuses 9.5 mm. to 16 mm. in length prepared by Carmichael's method from pregnant rats 14 to 16 days after time of insemination show significant increases in heart rate preceding and during mechanical stimulation by measured boar's bristles. There is a rough head to tail gradient of frequency of response. (Film).

Saturday Afternoon, June 12

ROUNDTABLE: ON POST-WAR REHABILITATION

ROBERT E. HARRIS, Chairman

Participants:

ROGER G. BARKER, Stanford University

OLGA L. BRIDGMAN, University of California and Dept. of Public Health, San Francisco

HAROLD D. CARTER, University of California

BARBARA A. MAYER, U.S.E.S., San Franciso

LT. T. W. RICHARDS, U.S.N.R., Mare Island Naval Hospital

OUTCOMES OF THE INTERSOCIETY CONSTITUTIONAL CONVENTION

JOHN E. ANDERSON
University of Minnesota

The Intersociety Constitutional Convention of Psychologists met in New York City, Saturday to Monday, May 29–31, 1943, in accordance with the plans formulated by the Sub-committee on Survey and Planning of the Emergency Committee in Psychology of the National Research Council (1) (2) (3) (4). The following delegates attended the meeting as representatives of their respective societies:

American Psychological Association: John E. Anderson, Leonard Carmichael, Clark L. Hull (alternate for John F. Dashiell), Calvin P. Stone, Robert M. Yerkes.

American Association for Applied Psychology: Paul S. Achilles, Steuart H. Britt, Alice I. Bryan, Edgar A. Doll, Arthur W. Kornhauser (C. M. Louttit).

Society for the Psychological Study of Social Issues: Gordon W. Allport, Gardner Murphy, Theodore Newcomb.

Society of Experimental Psychologists: Edwin G. Boring, Robert S. Woodworth.

Psychometric Society: Harold A. Edgerton, Irving Lorge, M. W. Richardson, P. J. Rulon (alternate for Paul A. Horst).

National Institute of Psychology: Ernest R. Hilgard.

National Council of Women Psychologists: Florence L. Goodenough, Gladys C. Schwesinger.

Department of Psychology, American Teachers Association: Herman G. Canady.

Section I, American Association for the Advancement of Science: H. E. Garrett, Edna Heidbreder.

Robert M. Yerkes, chairman of the Sub-committee on Survey and Planning, opened the Convention as temporary chairman. In his opening address he described the rapid transformation of the physical environment by discovery, invention and engineering skill, and stressed mastery of the social environment and the development of human engineering as our present task. The world crisis has created a unique opportunity for wisely planned and well directed professional activities. In the world that is to be, psychology will play a significant role if psychologists can only unite in making their visions realities.

The report of the nominating committee was then received and the permanent officers of the Convention elected as follows: Edwin G. Boring, Chairman; Ernest R. Hilgard, Vice-chairman;

Alice I. Bryan, Secretary; and Edna Heidbreder, Vice-secretary. The permanent Chairman opened the deliberations of the Convention by commenting upon the problems of federal and states' rights and stated that somewhere between the poles of centralization and decentralization there should be a form of organization which the American psychologists need and which the constituent societies want. He then outlined the mechanics of the Convention.

After a general discussion in which all delegates participated freely, it became clear that there was general agreement that unification of the efforts of the organizations interested in psychological activities was both desirable and timely. Three types of organization were proposed: (1) a loose federation of societies with a common secretarial office, (2) a reorganization of the American Psychological Association, and (3) the formation of a new society to replace the old societies. The delegates were divided into three committees: the first to formulate a plan for a federation, the second to formulate a plan for an ideal unified society, and the third to formulate a plan involving reorganization of the American Psychological Association. These committees met independently on Saturday evening and prepared detailed reports.

On Sunday morning these reports were presented by the several chairmen and considered in a preliminary discussion, without specific vote on any plan. At the end of the day a vote was taken on the order in which the three plans should be discussed in detail. The vote was 18 for discussing the APA reorganization plan first; 4 for discussing the ideal plan first, and none for discussing the federation plan first. The Convention then proceeded to discuss a plan for the revision of the APA By-Laws. After a number of suggestions had been made, a new and large committee was appointed to study the plan for reorganization already submitted together with the suggestions offered in the meeting and to prepare recommendations.

On Monday this committee, which had been at work the preceding evening, submitted a detailed mimeographed report which was discussed throughout the whole of Monday item by item. Particular emphasis was given to membership requirements, divisional organization, geographical branches and affiliated societies, the substitution of a representative body for the unwieldy business meeting, publication policy, and a mechanism for periodic review of the Association activities and for planning for the future. A Continuation Committee was then selected to frame the pro-

posals adopted by the Convention and arrange for their submission to the members of the constituent societies. On this committee were: E. R. Hilgard, Chairman; Alice I. Bryan, Secretary; Gordon W. Allport, John E. Anderson, Edwin G. Boring, and Edgar E. Doll. The duties of this Continuation Committee included a definitive formulation of the proposals adopted by the Convention and their submission, upon approval by the delegates, to the Governing Boards of the participating societies.

The Continuation Committee began its work by distributing among its own members various sections of the Proposed By-Laws together with the suggestions made by the Convention, for a more precise and detailed formulation. The results of the individual work of Committee members were codified by the Chairman, mimeographed and distributed to all the Convention delegates, with the request that criticisms and comments by returned. Of the 26 delegates present at the Convention, 24 returned suggestions and comments, some of which were long and detailed. These were assembled section by section and gone over with care at a meeting of the Continuation Committee, held August 7 and 8, Hotel Pennsylvania, in New York City, and a revised formulation for presentation to the constituent societies agreed upon.

This revision was presented to the Council of Directors of the American Psychological Association and the Board of Governors of the American Association of Applied Psychologists at the September meetings. These boards made suggestions for revision and recommended that their societies approve the By-Laws in principle and transmit them to their members for vote. This was done by the societies at their respective meetings.

On recommendation of their governing boards, the societies set up a Joint Committee which consists of John E. Anderson, Ernest R. Hilgard, and Willard L. Valentine, for the American Psychological Association, and Alice I. Bryan, C. M. Louttit, and Sidney L. Pressey, for the American Association of Applied Psychologists. The first duty of this committee was the incorporation in the proposed By-Laws of the suggestions made at the board and business meetings of the societies. This was done at a meeting in Evanston, September 2. Its remaining duties are (1) to make a Survey of Opinion regarding the proposed divisional structure, (2) to transmit the Proposed By-Laws to psychologists for suggestions, criticisms and comments in the Fall of 1943, (3) to revise the Proposed By-Laws if that seems desirable, and (4) to submit a

final copy of the Proposed By-Laws to the Members and Associates of the American Psychological Association and of the American Association of Applied Psychologists, in order that a mail vote can be taken in the Spring of 1944. The results of this mail vote, taken through the machinery of the societies, will be available to each society for such action as it deems desirable at its meeting in September, 1944.

The Proposed By-Laws, with a sample Survey of Opinion on the Divisional Structure and a request for criticisms and comments, together with statements by the Continuation Committee of the Intersociety Constitutional Convention and by the Joint Committee of the APA and AAAP will appear in the November issue of the *Psychological Bulletin.*

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PSYCHOLOGY AND THE WAR

Edited by
DONALD G. MARQUIS

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PSYCHOLOGY FOR THE FIGHTING MAN

Report of the Subcommittee on a Textbook of Military Psychology

EDWIN G. BORING
Harvard University

Psychology for the Fighting Man was published by the *Infantry Journal* about July 1 (1). The title page states that it was "prepared for the fighting man himself by a Committee of the National Research Council, with the collaboration of Science Service, as a contribution to the war effort."

The volume has 456 pages—the front matter, 437 pages of text (ca. 115,000 words), and 9 pages of index (ca. 900 items). The book is 'pocket size,' $6\frac{3}{8}$ by $4\frac{1}{4}$ in. with 20-pica lines. The paper is cheap and thin—the volume is just one-half inch thick—but the type is clear and easily legible. The 25-cent edition has a paper cover, although there is also a cloth-covered edition at $1.50 for libraries (which will not shelve paper-covered books), for reviewing journals (which ignore paper books) and for pedants. The paper-cover books can be bought at 19 cents each in quantities greater than fifty. The royalties go to a special fund of the National Research Council.

The book is distributed to civilians as a *Penguin Book*, to the armed forces by the *Infantry Journal*. One hundred fifty thousand copies have been printed from type. About half the edition was sold to distributors in the first two weeks after publication. Corrections can be made in a second printing, since the composition, a small part of the cost in this kind of publication, will then be done again.

The basic materials of the book were furnished by 60 collaborators, some of whom wrote chapters, others of whom assisted the authors of chapters in minor ways. The chapters were edited or rewritten as a rule by the various members of the Subcommittee, and then rewritten and rewritten antiphonally by Marjorie Van de Water of Science Service and myself, until neither of us was any longer able to criticize the other. After that Colonel Joseph I. Greene of the *Infantry Journal* had his chance at them, as did also Colonel E. L. Munson, Jr. Colonel Greene's careful and elaborate editing was especially valuable for military accuracy and style, and he should properly, in view of his services and constant inspiration, have been a member of the Subcom-

mittee. We also profited editorially in the process of clearance through the National Research Council.

The list of collaborators is given below, with asterisks on the names of the Subcommittee.

*G. W. Allport, Harvard University
T. G. Alper, Harvard University
J. W. Appel, M.D., Pennsylvania Hospital
Kenneth Appel, M.D., Pennsylvania Hospital
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A. L. Edwards, Office of War Information
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John Gorsuch, University of Pennsylvania
C. H. Graham, Brown University
Colonel Joseph I. Greene, Infantry Journal
*E. R. Guthrie, University of Washington
Roscoe Hall, M.D., St. Elizabeth's Hospital
J. S. Harding, Office of Public Opinion Research
Major T. W. Harrell, Personnel Procedures Section
R. R. Holt, Harvard University
Colonel George H. Horkan, Camp Lee
J. McV. Hunt, Brown University
L. M. Hurvich, Harvard University
Captain E. L. Jaques, M.D., Department of National Defense, Canada
Ben Karpman, M.D., St. Elizabeth's Hospital
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A. W. Kornhauser, University of Chicago
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G. R. Wendt, Wesleyan University
E. G. Wever, Princeton University
Kimball Young, Queens College

The volume consists of 20 chapters: an introduction, six chapters on the military uses of perception, three on selection and training of men, two on efficiency, three on motivation, morale and personal adjustment, and five on social relations (leadership, panic, national differences, rumor, psychological warfare). It is invidious to make comparisons in so socialized an undertaking, but Dr. H. S. Langfeld's editorial organization of the third of the book devoted to the perceptual functions is worthy of note.

The preliminary reception of these materials has been good. The *Infantry Journal* published the sections on morale, leadership, panic, rumor, races and peoples, efficiency, training, sight, and hearing in its nine issues from January to September, and will presumably print more. *Shipmates*, a journal for Annapolis graduates, adapted the chapters to the Navy, added dramatic pen sketches, and printed the chapters on morale, rumor, personal adjustment and the perception of position and direction in six issues from February to July, and will presumably print more. The editors of both these journals express enthusiasm about the text and the *Infantry Journal* has already carried a long favorable review of the book. *Life* reprinted a section on emotion, and *Time* a section on morale. Excerpts have also appeared in *Science Digest*, *Magazine Digest* (Canada), and the *Sunday Graphic* (London).

There have been numerous requests from inside the armed forces for permission, official or informal, to reprint or to mimeograph sections for use in instruction. The Chrysler Corporation has distributed some thousands of copies of the chapter on leadership to its officials, supervisors and foremen. One news commentator (Baukage) has praised the book at length in a broadcast and commented favorably upon it in a syndicated column. (This publicity brought in about a thousand orders.) Recent information shows that a unit of the Red Cross is distributing copies of the book to its social workers. These incidents, coupled with some expressed enthusiasm by military men engaged in instruction and by psychologists in the armed services, encourage the belief that this attempt to write valid psychology popularly and interestingly may succeed. There have already been favorable reviews—some very favorable—in the *New York Times Book Review*, *Science*, the *Saturday Review of Literature*, *Newsweek*, and the *New York Sun*.

The response from other psychologists is becoming clear. The older men who are closely associated with the needs of the Army and Navy seem to approve the book, many of them with enthusi-

asm. A few who have reacted negatively at first to its English style seem to have changed their minds. The negative criticisms, direct or implied, that have already come to me, are mostly from younger psychologists who seem to feel that rigorous scientific standards of exposition have been violated. While it would be odd to find youth more pedantic than age, it is after all reasonable to suppose that flexibility should depend on security and that standards recently acquired could not be relaxed.

The Subcommittee is continuing its work by the preparation of a textbook of military psychology more nearly at the collegiate level. This book will introduce general principles and more evidence than was possible in *Psychology for the Fighting Man*, while still attempting to avoid pedantry, the discussion of method, and the presentation of facts as the results of a single research. While it was hoped to publish this new text in the fall, the task is considerable and no prediction is possible at the present time.

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PSYCHOLOGY FOR THE FIGHTING MAN

A Special Review

WALTER S. HUNTER
Brown University

Committee of the National Research Council and Science Service. Psychology for the fighting man. Washington, D. C. and New York: Infantry Journal, Penguin Books, 1943. Pp. 456.

When the Emergency Committee in Psychology of the National Research Council approved the preparation under its auspices of a book on military psychology, wisdom dictated the assignment of the responsible editorship to E. G. Boring. It was necessary, however, for the Committee to proceed beyond this point and to decide whether the book should be a handbook, a textbook for study, or a volume to be read and enjoyed by the soldier whose schedule called for no training in psychology. Bearing in mind the confidential and restricted character of much of the current work in military psychology, the decision was made to prepare a volume suitable for non-classroom reading. This involved writing in a popular science style which no academic psychologist had mastered. For this reason the Emergency Committee suggested that the services of Miss Marjorie Van de Water of Science Service be secured, and she was added to the editorial group. The contribution which the present volume makes to the widespread understanding of the essentials of military psychology is due to two equally important factors: (1) the assembling of essential factual material by the Editor's professional collaborators; and (2) the skill of Miss Van de Water and Dr. Boring with the aid of Colonels Greene and Munson in writing English that the non-student public can read.

The level at which the book is written and its consequent popular appeal have caused some apprehension and adverse comment. The reviewer's own attitude can best be expressed by a quotation from a letter written to a non-psychologist whose official status required him to have an opinion on the prospective book: "There is a great similarity between medicine and psychology that should be noticed in this connection. In medicine one has (1) the medical sciences, (2) the practice or application of medical knowledge, and (3) the teaching of the patient to understand and care for himself. So in psychology one has (1) experimental or fact finding psy-

chology, (2) the application of this knowledge in industry, the Army, etc. and (3) the teaching of the individual to understand and care for himself particularly now in fear and conflict situations. Such sciences as physics and chemistry have only two of the above aspects, science and technology. They lack the third since you cannot teach a solution or a radio set to take care of itself or to understand itself."

Without listing all of the chapter headings and authors (given by E. G. Boring elsewhere in this issue of the *Bulletin*), one can get an impression of the contents and nature of the book by noting a few of the topics discussed: sight as a weapon, hearing as a tool in warfare, the right soldier in the right job, morale, leadership, the soldier's personal adjustment, and psychological warfare. Since the topics selected and the amount of space allotted to them were determined by practical usefulness, it is worthwhile to note that approximately 34% of the textual material is devoted to sensory and perceptual problems; 27%, to social behavior; 22% to learning and efficiency; and 11%, to personality. The great applied importance of sensory psychology will not surprise the experimentalist, but it may give others food for thought. Certainly it suggests that some writers of college texts may be seriously in error when they allot about 10% of space to this topic. Experience has already indicated that *Psychology for the Fighting Man* can be advantageously used as a supplementary college text. It has no systematic scientific bias toward Gestalt, behaviorism or structuralism. Although some errors may be expected in the text, few will obtrude themselves on the general reader. The reviewer however would like to object to the continued printing of a diagram of the ear (Fig. 30) showing the cochlea pointing up and in rather than down, out and forward which is the true state of affairs. One specific excellent feature of the volume is the frequent account of simple observations that can be made of psychological phenomena, e.g. the account on page 68 of observations on dark adaptation. Qualitative observations of this type have an important role in acquainting the student with psychological phenomena. E. C. Sanford's *A Course in Experimental Psychology* (1898) stressed such procedures but their further development was halted, or obscured, by the vogue of the more "rigorous" procedures of Titchener's experimental manuals. At present no collection of this very valuable type of material is available. Presumably it exists only in the repertoires of successful teachers.

So far as the reviewer knows, there are no other books in this field with which *Psychology for the Fighting Man* can be fairly compared, although one thinks at once of F. C. Bartlett's *Psychology and the Soldier* (1927) and of the *Psychology of Military Leadership* (1943) by L. A. Pennington, R. B. Hough and H. W. Case. The anonymous authors of the following discussions in the present volume deserve special commendation: vision, how men meet defeat, the soldier's personal adjustment, and leadership.

PSYCHOLOGY IN THE SELECTION OF RECRUITS AT THE U. S. NAVAL TRAINING STATION, NEWPORT, RHODE ISLAND*

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Every recruit receives an individual interview with a psychiatrist as part of his medical reexamination upon arrival at the U. S. Naval Training Station in Newport, Rhode Island (**7**, **8**). This neuropsychiatric reexamination has been found necessary, even though most of the recruits have received a previous screening in their induction center (**6**). If the psychiatrist feels that the recruit may be feebleminded or illiterate, he immediately refers him to a psychologist stationed in the receiving building. Here the suspected recruit is given a brief 10-minute individual test for intelligence, a test which has been described elsewhere (**5**). It is devised primarily for the purpose of rapid detection of the feebleminded recruit. Some of the testing which the psychologist does in the receiving unit is done upon neuropsychiatric cases where the diagnostic picture is unclear and where the psychiatrist feels that a psychometric test may well bring out further material which will be helpful in clarifying the possibility of some fundamental psychopathy. If those men who have been suspected only of feeblemindedness pass the intelligence test in the receiving unit, they are sent to duty. If the results are doubtful, the men are sent to trial duty and called in for re-observation at a later date after they have had a chance at adjustment to the demands of the training period. At this time a report from their company commanders is available to aid the psychologist in making his decision as to the recruits' suitability for service. If they fail in the examination in the receiving building, they are immediately referred to the observation ward for further testing and possible elimination from the Naval service.

On the observation ward they are seen by another psychologist, who administers a Wechsler-Bellevue test to them. Other tests may be given when indicated if it is necessary to evaluate further specific reading difficulties, and educational and language handicaps. The specific tests given vary with the demands of each case. While he is on the observation ward, the recruit is also sent to the

* The opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

Selection Department, where he receives the General Classification Test, a spiral omnibus paper-and-pencil test of intelligence. The results of all these tests are evaluated in deciding upon the recruit's disposal. Should he convince the psychologist of his acceptability, he is sent to duty from the observation ward. If not, a recommendation for his discharge is made to the Aptitude Board. Each man whose discharge is recommended has thus been seen by two different psychologists and has received one group and two individual tests.

Recommendations for discharge are presented to the Aptitude Board. According to the Naval directive, one of the five members of this board must be a psychologist. The other members are two psychiatrists, one general medical officer, and one Line officer. All special order discharges for any reason at all are reviewed by this board. The board's recommendations are then reviewed by the Commanding Officer, and his decision is final.

In addition to the cases of suspected feeblemindedness and illiteracy, the psychologist on the observation ward is called upon to handle many cases referred to him by the psychiatrist, who may wish a psychometric testing in order that possible deterioration or abnormal mental functioning may be demonstrated in the test situation. Personality tests, such as the Rorschach Ink Blots, are also given where requested in psychiatric cases. Every recruit sometime during his stay at the Training Station is given a series of educational tests by the Selection Department. All men scoring below a certain point on these tests are referred to the psychologist for further examination for feeblemindedness or illiteracy. In addition, men may be sent in for examination from the trade schools, Sick Bay, and from Ship's Company.

The directives setting forth the duties of the Neuropsychiatric Unit include the task of improving current techniques of examination. While the first task of the Neuropsychiatric Unit is the carrying out of the screening process itself, wherever time and opportunity offer themselves a genuine research attempt is made to improve the methods of screening, in order that the working efficiency of the Unit may be raised. Among such practical investigations undertaken by the Newport Unit have been ones on the importance of test scatter as a diagnostic aid (**3**), the detection of malingering (**2**), the use of neurotic inventories (**4**), and the usefulness of the electroencephalogram in the prognosis of head injury cases (**1**). Here the special talents of the psychologist are impor-

tant because of his research training and familiarity with statistical techniques.

The Newport Unit has always operated with the philosophy that the abilities of the psychiatrist, with his specialized clinical training, and of the psychologist, with his mastery of objective techniques, are complementary to one another and that the best results in screening are obtained when these two disciplines work together as a unit.

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THE DEVELOPMENT OF THE H-D CODE APTITUDE TEST: A PRELIMINARY REPORT

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In the May issue of the *Psychological Bulletin*, there appeared a comprehensive article on the development of code aptitude tests for Army needs (1). The report described four different types of tests. The least efficient of these was the Substitution Test, a paper and pencil test which involved the learning of paired associates. Another was the Code Rhythm Test which " . . . measures the ability of an individual to differentiate between the dots and dashes used in code and to remember code patterns of varying length" (1, p. 363). A third type was the ROA (Radiotelegraph Operator Aptitude Test) which measures the ability to make auditory discriminations. Of the fourth the article reports, "The code learning test, which attempts to sample the job involved in the training itself, appears to be definitely the most promising approach at present to the problem of selecting inexperienced men who will master the code most rapidly" (1, p. 368). The latter CLT test has a reported reliability in the high .90's, and validity coefficients of −.46, −.41, −.36, and −.33 for inexperienced students who attained a speed of 4, 8, 12, and 16 words per minute respectively.

This brief report aims firstly to describe some of the results obtained in the preliminary tryout of a different approach at St. Louis University, where a program had been instituted to train civilians as instructors in Radiotelegraph Operation; and secondly, to set forth other results pertinent to code aptitude tests.

This research was undertaken because the school authorities were dissatisfied with the efficiency of the ROA test mentioned above. The latter test was used regularly in the school's orientation program. The re-test reliability coefficient was found to be .73 on a group of 41 students which is almost identical with the .75 reported in the May article. Validity coefficients hovered very close to −.40, a figure higher than the range of −.25 to −.30 reported in the article cited. Doubtless the presence of a few experienced operators in our groups may account to some degree for the higher validity coefficients.

As a first step toward improving the selection of potential operators at St. Louis University, a careful "job analysis" of the

learning situation was made. From this analysis it was concluded that the following measurable factors would be most likely to prove significant in code receiving: 1) auditory discrimination; 2) associative memory of a kind where a certain pattern of sounds can be retained in mind and recognized among other patterns; 3) sustained concentration—there were instances in which students showed abilities (1) and (2) but could not receive code solidly because of apparently involuntary lapses of attention; 4) sense of rhythmic patterns, a factor which appears to be less necessary at the lower speeds but more important at the higher speeds; 5) auditory-motor coordination; and 6) speed of reaction.

The validity of the foregoing analysis appears to be strikingly confirmed by the different approaches employed by psychologists as described in the May report.

With this job analysis in mind, the experimenters set up a test situation which presupposed auditory discrimination, but which, it was believed, also measured other factors, particularly associative memory and sustained concentration. Essentially the test consists in giving a key signal which the individual is instructed to retain in mind and compare with other signals. Then a series of ten test signals is given, each of similar length to the key signal which included from two to six dots and dashes in code. The examinee's task is to select from among the test signals those which are identical to the key signal. This is done by checking a mimeographed sheet. The score is calculated by the addition of the errors made in the whole test. The administration time is approximately twenty-five minutes including allowance for directions.

In its preliminary form the new test included twenty-six series, each made up of a key signal and ten test signals. An analysis of this form was carried out with scores obtained from administration of the test to students without previous code experience. The analysis showed the following facts:

1. The reliability of the new H-D test, as determined by the split-half method and the Spearman-Brown formula, was found to be .80 in a group of fifty students without code training.

2. The correlation between scores in the new H-D and the ROA tests was .61 for a group of 27 beginning students. This indicates that the two tests tend to measure somewhat the same ability although the other evidence suggests that the new test measures this ability more efficiently than does the ROA test.

3. The validity of the new test in its preliminary form was

determined by correlating the original test scores with code speed after ninety-six hours' training in code. In a group of twenty-five students a correlation coefficient of −.50 was obtained, a figure which is highly significant statistically as indicating relationship. In the same group the ROA test yielded a validity coefficient of −.36. The number of cases is small but the new test shows enough promise to warrant further research.

4. In an analysis of each series, it was found that those series containing items with the greatest and least number of elementary dots and dashes, namely, six and two, were least discriminating between high and low aptitude scores, and between high and low speed scores in actual code learning. Consequently, in a revised and lengthened form of the new test it was decided to include more items containing patterns of three, four, and five elementary sounds.

5. A correlation of −.20 was found between intelligence as determined by the American Council on Education Psychological Examination, Form 1942, and error score on the H-D Code Aptitude Test. The group studied was highly selected, and more than half of the individuals were college graduates. By itself this single correlation coefficient is not statistically reliable but it coincides with the results obtained among larger groups, as reported in the article cited above.

6. A correlation coefficient was also calculated between age and error score on the new code aptitude test. The coefficient of −.09, determined on twenty-eight students ranging from 20 to 46 years in age, is not statistically reliable.

7. A re-test, after the students had received ninety-six hours of code instruction, demonstrated that experience would affect appreciably the scores on the new aptitude test. The average error score of twenty-six students on the H-D Code Aptitude Test was 42.0 on the first administration, and 12.0 after the code instruction; this difference was significant beyond the 1% level of confidence. Obviously, the effect of including experienced operators in a validity study would be to raise the coefficient considerably.

No further experimentation of the H-D Code Aptitude Test is possible at St. Louis University because the training program is being discontinued. However, the results obtained from the preliminary form of this test would seem to indicate the possibilities of improved efficiency of prediction if it could be tried out elsewhere. The reliability of the instrument could be increased

by the inclusion of more discriminative series, and by standardizing the procedure of administration. Accordingly, the original test has been lengthened in line with the item analysis already mentioned, and the revised form transcribed upon phonograph records. In this form, its predictive efficiency still awaits verification.

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PSYCHOLOGY AND THE WAR: NOTES

The Army Specialized Training Program. The course in Advanced Personnel Psychology of the Army Specialized Training Program (ASTP) has been described earlier (*Psychological Bulletin*, 1943, **40**, 429–435). The following eleven universities were selected to conduct this training program, and during June and July approximately 100 students were enrolled in each of the universities.

Cornell University	University of Chicago
Harvard University	University of Iowa
Ohio State University	University of Minnesota
Purdue University	University of Pennsylvania
Stanford University	University of Pittsburgh
University of California	

Changes in the Office of Psychological Personnel. Dr. Donald G. Marquis has been appointed Director of the Office of Psychological Personnel replacing Steuart Henderson Britt who resigned May 30, 1943, to accept a commission as Lieutenant in the USNR. Dr. Marquis will serve part-time in the Washington office and will continue as Chairman of the Department of Psychology, Yale University. Mrs. Jane D. Morgan has been appointed Assistant to the Director to replace Miss Iris M. Stevenson who resigned July 30, 1943, to take a commission in the WAVES.

The Office of Psychological Personnel is supported by the national psychological associations under the auspices of the National Research Council, and is located in the building of the National Academy of Sciences, 2101 Constitution Avenue, Washington, D. C.; telephone Executive 8100, extension 175. The function of the Office is the furtherance of the effective utilization of psychology and of psychologists in the war effort. Detailed reports of Office activities have been published in the *Psychological Bulletin* (1942, **39**, 773–793; 1943, **40**, 436–446).

A central file is maintained of information submitted by psychologists willing to be considered for positions in Federal agencies, special research projects, universities, etc. Upon request from a prospective employer, a list of names of those who appear qualified and interested in the position is furnished. Approximately twenty such requests, for from one to ten psychologists, are received each month. Any psychologist may avail himself of this service by writing to the OPP for registration blanks.

When a psychologist is inducted into military service, a statement of his qualifications, training, and experience is sent to the appropriate officer in the Army, Navy or Marines where it is available when needs for specialized personnel arise in classification and replacement. Psychologists who expect to be inducted in the future should, therefore, file registration forms and subsequently notify the OPP of the exact date and place of their induction.

The Office also serves as a central "clearing house" for information regarding the activities of psychologists in military and government work, and for information about projects and developments of interest to psychologists.

ZILBOORG, GREGORY (in collaboration with HENRY, GEORGE W.). A History of Medical Psychology. New York: W. W. Norton, 1941. Pp. 606.

A detailed review of this massive history of medical psychology is out of the question but a brief condensation that will bring into bold relief the trunk lines in the evolution of medical psychology can be attempted. Its author prefers the term "medical psychology" because it is at once older and more comprehensive than either "psychiatry" or "abnormal psychology." As here used, "medical psychology" embraces everything practical as well as theoretical relating to the cause, cure or prevention of mental illness.

The advancement of medical psychology is closely linked with the fortunes of the naturalistic approach to mental illness, which exhibits two evolutionary tendencies. One pertains to methodology and runs from clinical observation, description, classification to experimentation. The other pertains to the etiology of mental disease and runs from physiogenic and constitutional to psychogenic (sociogenic) explanations.

Among the ancient Greeks and Romans who also had supernaturalistic and metaphysical explanations naturalistic theories attained their clearest expression in *Hippocrates*, *Celsus* and *Galen* who assigned causal roles in the genesis of mental illness to body humors (phlegm, bile, blood), warmth and dampness in the brain, climatic conditions. Hysteria was associated with perigrinations or engorgements of the womb. Hippocrates and Galen with their medicopsychological materialism laid the foundation for the tradition of identifying the naturalistic approach with physiogenic theory. They introduced clinical observation and a classification of mental diseases namely, malancholia, mania and epilepsy. Among cures suggested were bleeding, emetics, white hellebore and other purgatives.

"Medical wisdom came to an end with the passing of Galen." The Dark Ages of medical psychology set in with the influx of a peculiar conglomerate of Jewish, Egyptian and Persian superstition and charlatanism. For a thousand years mental disease was variously associated with spirits, demons (incubi and succubi), astrology, alchemy and a garbled humoral psychology of the Greeks and Romans.

Out of this hotch-potch gradually crystallized the idea "that physical illnesses were natural and that mental illnesses were mostly supernatural." The darkest period of medical psychology came just at the dawn of the Renaissance when sometime between 1487 and 1489 Heinrich Kraemer and Johann Sprenger, fervently believing the mentally ill to be witches possessed of or in league with the devil, published their *Malleus Maleficarum* (The Witches' Hammer) in which most human ills and particularly sexual disorders are attributed to witchcraft. Subsequently these monks succeeded in persuading Pope Innocent VIII to issue a bull empowering them to seek out, convict and punish witches as they saw fit. Thus did the Inquisition get its start. In the sixteenth century and a goodly part of the seventeenth, the world went mad witch-hunting and witch-burning. Several hundred thousands of mentally ill individuals

were burned at the stake or tortured beyond repair. It fell to the lot of women to suffer most direfully in this holocaust. But even in the presence of such persecutions, the medical profession and some leaders of thought remained conservative on the question of witchcraft.

Strangely enough, one good that may be associated with the era of witch-persecution was the impetus given to a few courageous leaders to examine fearlessly the human mind and to study empirically and descriptively the nature of mental disease, particularly the role of emotions, and to voice protest against Inquisitorial sadism. For the first time the term "psychology" was used in 1590 by Rudolf Goeckel.

Thus came about the *first psychiatric revolution* in which *Juan Luis Vives* (1492–1540), *Paracelsus* (1493–1541), *Heinrich Cornelius Agrippa* (1486–1535) and the latter's pupil, *Johann Weyer* (1515–1588) by way of protest laid the foundation for a scientific and humane attitude towards the mentally ill. Vives advocated humanitarian treatment and stressed the psychodynamics of emotion in the genesis of mental suffering. Paracelsus regarded mental illness as natural disease, rejected demonology unequivocally, and was even opposed to attaching the names of saints or devils to any disease. Agrippa, like Vives, defended the nobility and achievements of women against the sadistic misogyny of the monks. His attack both upon monkdom and upon the hypocritical medical profession made him a victim of slander and vengeance. Johann Weyer, styled by Zilboorg "the father of modern psychiatry," persistently maintained that the so-called witches were innocent and as sick people should be turned over to a physician for treatment. He accused the persecuting priests and monks of being the real sorcerers. He refuted many contentions of the pernicious *Malleus Maleficarum* and likewise many current superstitions which he held up to ridicule in the light of his clinical observations. Although he believed that malicious individuals poison others, he felt that the devil was not to be blamed for such crimes. He stressed the role of phantasy and imagination in the causation of much mental illness. Jean Bodin (1530–1596) sought conspicuously to set the clock back by defending the *Malleus Maleficarum* against Weyer's attacks. As a lawyer Bodin strenuously opposed Weyer's suggestion that the criminally insane are not responsible and should be turned over to physicians for study and treatment. Paul Zacchias (1584–1659) in his adherence to the position of Bodin in respect to the legal responsibility of the criminally insane deserved to be called the founder of legal medicine. Bodin and Zacchias did much towards that rigidification of the legal mind against psychiatry which persists even unto the present day.

Not until the 18th century did the reform-notions suggested by Vives, Paracelsus, Agrippa and Weyer bear fruit. Although the mentally ill were no longer being burned at the stake, their lot was still pitiable. Frequently chained, they were now being herded without regard to sex, age or condition into foul prisons. Either no effort was made for them save to restrain them or else, in medical quarters, they were the subjects for bizarre neuroiatro-mechanical experiments such as blood-transfusions, blood-letting, ducking etc., which are strongly suggestive of some present-day practices such as insulin-shock, metrazol-injection and the drilling of

small holes in the frontal region. Two prison-asylums of this period gained great notoriety: Bicêtre in Paris and Bedlam in England. It was to the pandemonium of the Bicêtre that *Philippe Pinel* (1745–1826) came in the role of superintendent. Dr. Pinel's first act was the removal of the iron chains from the insane. He followed with a number of humanitarian practices such as fresh air, sunlight and reverence for the individual personality. He introduced systematic taking and keeping of case-histories. He was soon called to head the Salpêtrière where also "mad men and women" were locked up. Here Pinel ordered the chains removed, reorganized and trained the personnel, advocated "moral treatment" and studied cases under a fourfold classification: mania, melancholia, dementia and idiocy.

About the same time *Anton Mesmer* (1734–1815) who came to Paris with his newly discovered "animal magnetism" took the city by storm with the spectacle of the miraculous cure of hysterical women and of the artificial production of hysterical phenomena. The medical profession was both incredulous and denunciatory. A joint committee from the *Académie des Sciences* and the Faculty of Medicine was appointed to examine the practice and curative effects of magnetism. The committee reported that "imagination without magnetism produces convulsions," that "magnetism without imagination produces nothing," that animal magnetic fluid "does not exist" and that the violent effects seen in public treatments result "from the imagination which is set in action." The repeated excitement of the imagination to produce crises was adjudged as harmful. However, Mesmerism did not down. *Charcot* towards the end of Pinel's life began his studies of mesmerism at the Salpêtrière. Later (1837) *John Elliotson*, professor of medicine at the University of London, and *James Esdaille* in India (1846) introduced mesmerism as an anaesthetic in surgical operations. In America *P. P. Quimby* (1861) cured Mary Baker (Eddy) of hysterical paralysis with mesmerism. Back in England *James Braid* (1795–1860) who became interested scientifically in the study of mesmerism rechristened it "hypnotism," discounted the magnetic fluid or the magic of the ceremony and lodged the secret of hypnotism in the suggestibility of the subject and in the soporific character of the suggestions given. Subsequently a distinction sprang up between the Salpêtrière School under *Charcot* and *Janet* and the Nancy School under *Liébeault* and *Bernheim* as whether suggestibility is a morbid phenomenon or a normal one with the Nancy School subscribing to its normality. Zilboorg attributes to Mesmer the discovery of the neuroses, i.e. the psychogenic maladies.

The nineteenth century saw medical psychology entrench itself. "The growing interest in the mentally ill, the study of mental illness, the building of hospitals and clinics, the foundation of psychiatric societies and psychiatric periodicals, the publication of many and voluminous books on medico-psychological subjects makes the psychiatry of the nineteenth century a confusing and complex structure of manifold aspects." In these matters France took the early lead with the most prominent names being *Guillaume Ferrus* (1784–1861)), *J. E. D. Esquirol* (1772–1840), *Fodéré* (1764–1835), *J. P. Falret* (1794–1870), *B. A. Morel*

(1809–1873) and *Magnan* (1835–1916). "French medical psychology was at once humanistic, rational, practical and experimental. It remained firmly rooted in the physiogenic, distrustful of psychogenic explanations." Rousseau's 18th century elucidation of man's enmity with his nature as basic cause of man's misery, not to mention similar sociogenic indications of the 19th century as to the origin of mental conflict from Maine de Biran and Jouffroy (*homo duplex* theory) down to Bergson (theory of the *Moi profond* and the *Moi parasite*), had but little, if any, influence upon the dominant physiogenic trend of French medical psychology.

In England interest was confined to hospital reform, legislative reform and hospital organization. Conspicuous in this regard was the work of *Daniel Hack Tuke* (1827–1895), great-grandson of *William Tuke* who had founded the York Retreat. The name of *H. Maudsley* (1835–1918) became more widely known by reason of his many publications in which he persistently subscribed to the physiogenesis of mental illness. Anemia, toxic states of the blood, other circulatory defects, infections, poison, overexertion were for him the etiological factors.

In America *Benjamin Rush* pioneered psychiatry but did no more than introduce European tradition. A high spot in American psychiatry of the nineteenth century came about the time of the Civil War when *Dorothea L. Dix* took it upon herself to lobby State legislatures to provide for the building of State insane asylums. She met with remarkable success and subsequently carried her campaign to England. The *American Psychiatric Association* was formed in 1844 and it in turn founded in the same year the *Journal of Insanity*.

Germany entering the field somewhat tardily produced four world-famous psychiatrists: *Wilhelm Griesinger* (1817–1868), *Karl L. Kahlbaum* (1828–1899), *Emil Kraepelin* (1855–1926) and *Krafft-Ebing* (1840–1903). These and many other leaders of German psychiatry were dyed-in-the-wool somatologists and as such were definitely opposed to all romanticizing about a psychogenesis of mental disturbance. All were interested in nosography. Kraepelin's twofold classification of mental diseases into dementia praecox and manic depressive psychosis attracted world-wide attention. Kraepelin, a student of Wundt's, did not become head of an asylum but of a psychiatric research institute in Munich which devoted itself to the study of the physiology, cerebral anatomy and heredity of mental diseases. In America the Phipps Psychiatric Institute, long headed by *Adolf Meyer*, was to become a research center somewhat similar to the one presided over by Kraepelin but differing from it in that every possible approach to mental illness was to be open to exploration. The physiogenic-constitutional approach, despite its dominance in German medical psychology of the 19th century, was not unopposed. *J. C. Heinroth*, *A. Haindorf*, *F. Groos*, *Carl W. Ideler*, *F. E. Beneke* and *E. Feuchtersleben*, along with the philosopher-psychologist, *Friedrich Nietzsche*, protested medico-psychological materialism and with romantic fervor gave prominence to the psychogenesis of mental illness, i.e. to the role of suggestion and of conflict between natural human yearnings and social restraints.

What Zilboorg characterizes as the *second psychiatric revolution* was

the twentieth century shift of emphasis from constitution and physiogenesis to psychogenesis, i.e. sociogenesis. Zilboorg attributes this revolt to the psychoanalysis of *Sigmund Freud.* It was Freud (1856–1939) who at last formulated within medical circles a psychology which could convincingly explain neuroses—a psychology the lack of which had impeded so long the advancement of the psychogenic approach to mental illness. His was a dynamic psychology which recognized the instinctual tendencies of man, particularly the sex-instinct. Cultural repression of instinctual tendency leads to neurotic derailment of this instinctual tendency as seen in conversion-hysteria, anti-social attitudes, dual personality, dreaming, pleasure-thinking, anxiety- and guilt-feelings, compromise-reactions, regression etc. What appears so singular is the fact that this dyanmic psychology intimated for centuries by philosophers, novelists, sexologists and even by more romantic psychiatrists like Heinroth, Ideler and others, had not borne fruit in medical psychology long before Freud. The reason, however, may be seen in the fact that the somatologists having the ascendency in psychiatry and identifying science with materialism had steadfastly refused to yield the floor to any immaterialistic theories. Freud himself had no easy time in getting himself heard.

Freud did not deny the existence of mental illnesses which are due to constitutional (the psychopathies and mental deficiency) or somatic factors (the psychoses) but did insist that he was not concerned with such abnormalities. His theory and practice were strictly confined to the neuroses.

Freud's vast influence on medical psychology was due in part to his enthusiastic disciples and to the many journals of the psychoanalytic movement, not to say anything of the prodigious number of writings by the founder himself. Freudianism found welcome in America, G. Stanley Hall, A. A. Brill, Smith Ely Jelliffe, William Alanson White, James J. Putnam warmly endorsing and enlarging upon it. Among Freud's immediate pupils the two most illustrious were *Alfred Adler* and *Carl Jung* who have themselves made signal contributions of their own to the psychodynamic theory of the neuroses. Among important psychiatrists in charge of mental hospitals the first to be won to the psychoanalytic viewpoint were *Eugen Bleuler* in Switzerland and *William Alanson White* in America. The former in association with Carl Jung sought a psychogenic explanation of dementia praecox and rechristened the malady "schizophrenia."

In the light of all this great progress made in medico-psychological knowledge it is highly amusing to read in the preface by Reverend Montague Summers to his, the first English translation (1928) of the *Malleus Maleficarum* a pious belief in witches, at least figuratively speaking, and a justification of the methods employed by the Holy Office to exterminate that dark fraternity of which the Third International, the Anarchists, the Nihilists and the Bolsheviks are to be regarded as variants unfortunately surviving today and hell-bent on destroying monarchy, private property, inheritance, marriage, order and religion.

The final two chapters of Zilboorg's book are contributed by Dr. Henry who presents the history and present status of psychiatric knowledge about each of the definitely organic mental diseases (general paralysis, senile psychosis, alcoholic psychoses) and the history of mental hospitals.

Zilboorg's study, obviously a life-work, is a remarkable piece of scholarship and a serious contribution to the history of science. Yet many phases of the history of medical psychology are not touched, such as the history of American medical psychology, the history of psychiatric nursing, the history of out-patient care, the history of the mental hygiene movement. The author is, however, cognizant of these shortcomings but confesses that he must leave these matters to other historians.

A chapter which should have been appended to this book would have sketched for the past few decades the various dynamic and mechanistic theories of the psychogenesis of neurotic disturbances. On the dynamic side mention should have been made, beyond the Freudian School, of Jaspers of Cultural Science Psychology, Adler of Individual Psychology, McDougall of Purposive Behaviorism and Stern of Personalism. On the mechanistic side mention is certainly due J. B. Watson, Pavlow, Janet, Hollingworth and Guthrie.

The academic psychologist, as Zilboorg would leave it appear, has contributed almost nothing to this evolution of medical psychology. That point of view or better that blind-spot may be accounted for at least in part by the fact that the author and his collaborator are both medical men. Certainly a psychologist has a right to expect some mention of psychologists who are not medical men but who have contributed to aspects of medical psychology such as Binet, Tredgold, Goddard on mental deficiency, Franz and Lashley on the vicariate functioning of the brain, Koehler on the nature of intelligence and Gelb, Goldstein and Fuchs on brain-injured patients. Nowhere in Zilboorg's work is mention made of the *British Journal of Medical Psychology* or of the *Journal of Abnormal and Social Psychology*. Singularly, it is just against such insularity on the part of medical men that Zilboorg complained in so many parts of his work.

The 17th century which Zilboorg leaves rather barren of medico-psychological works saw produced an imperishable one: "*The Anatomy of Melancholy*" by Robert Burton. This book so largely concerned with what has more recently been styled "neuroses" is left unmentioned by Zilboorg.

F. C. SUMNER

Howard University

WOLF, A. W. M. Our children face war. Boston: Houghton Mifflin, 1942. Pp. vii+214.

The author's intention is to present suggestions that are helpful to parents and teachers in dealing with children in war-time. Although some of the suggestions are not new, except perhaps to the lay reader, others are based on recent findings in both technical researches and prac-

tical fields. The author shows good judgment, tempered by experience, in presenting suggestions that are practical, constructive and psychologically sound.

Among the ideas presented, one finds certain salient ideas that are frequently reiterated. A few of these are: There is no child psychology operative in war-time that is different from that of peace-time. A child's ability to meet the uncertainties caused by war is dependent on his mother's emotional balance and fortitude—it is from her that he takes his cues. Affection genders a feeling of security in times of crisis. Family solidarity fosters not only good morale but growth in democratic living. Hope for the future peace of the world rests on the cultivation of wholesome attitudes toward individuals as well as toward groups.

The author emphasizes the mother's role almost to the complete exclusion of the father. She presumes, rather erroneously, that most fathers are either in the armed forces or so preoccupied with defense work that they exert a negligible influence on the life of a child. In this the author reveals the bias of her sex. Chapter V, "Women and the War," although interesting, tends to be devoted to women in the upper income bracket, and hence is limited in scope.

The author's style is good, illustrations are frequent, section titles are suggestive. Several chapters have excellent summaries. There is a classified list of readings. Although chapters I, IV and VI are strongest, the lay reader will find the entire book interesting and profitable reading.

GEORGE J. DUDYCHA

Ripon College

KATONA, GEORGE. War without inflation—The psychological approach to problems of war economy. New York: Columbia University Press, 1942. Pp. x+213.

The focus here is a concrete social problem, the fostering of anti-inflation morale; yet there is frequent and pointed discussion of the methodological issues involved in this scientific approach. It is the author's concern to demonstrate that certain psychological facts and principles add much, in fact, seriously modify the current economic theories about inflation. What follows is an insightful application of these psychological considerations to the concrete question of preventing dangerous price-soaring, through proper government publicity, or mass communication. The legal and economic requirements are never ignored nor underestimated; yet new attention is called to certain psychological requirements for cooperative public attitudes in a democracy at war.

The traditional theory of inflation views it as an automatic process rising out of "impersonal" economic factors, such as the absolute supply and demand of commodities, their relative price levels, and the consequent flow of currencies. The standard texts and classic treatises usually ignore the variable psychological factors affecting the "economic persons" in these economic processes; yet there are surely significant variations possible in the *expectations* of these persons about the "purely" economic factors, such as price, supply, etc., and changes may be sought in their selfishness, the *motivation* of their behavior, beyond those of

profit. Katona's psychological principles deal with these two aspects especially as they affect the consumer, the general public. Thus the government must carefully explain the framework for such measures as price-fixing and rationing; full understanding of the economic dynamics and of their dangers are proposed as prerequisite for satisfactory response to the legal measures. Also, the various types of taxation and of appeals for saving are believed most effectively responded to by rational, responsible cooperation, rather than compulsion or "reward and punishment." The key is a reasonable, democratic psychological preparation. "Explaining, then, has the function of making people endure a deprivation willingly" (75).

A number of very practical suggestions are made in the section on government publicity, to meet the need for effective explanation, for adequate advertising, and for the productive punishment of violators. Towards these ends, the government must have a sufficiently intimate appreciation of public attitudes and practices, through a careful use of opinion polls and interviews; these devices for implementing democratic rule are subjected to an especially keen critique. The author discusses, finally, some potential needs for a post-war psychological campaign to enlist public morale against the dangerous economic conditions likely to prevail.

It is with the psychological principles utilized, not the purely economic analysis, that some issue is to be taken. The principles are closely related to the experimental findings in the author's previous book ("Organizing and Memorizing," 1940), and are allied to the tenets of Gestalt psychology. The emphasis is on the potential values of the objective understanding of "the requirements of the field," on the power of reason in producing rational behavior. There is a minimization of the importance of reward and punishment, of "repetition," and of other "non-rational learning" as being "rare and not enduring" (65). As applied to this real social problem, the devaluation of less intelligent behavior is misleading, and overoptimistic. And as a methodological resolution, the dichotomy of behavior, with or without rationality, is overdrawn and somewhat unnatural. For reasonable behavior occurs always within an implicit framework of goals and values and motives, and of the rewards and punishments en route. And "repetition" must be admitted as often being successful, though the success may appear to be lacking in common sense values. But there is always at least a looser framework of meaning within which repetition, or even a single occurrence, of a learning situation serves a relevant function or purpose, or meets certain needs of the individual. Katona concedes, for example, that unfounded rumors may form strong associations and incentives to action (59). But, typically, the focus is wrongly placed on the frequency of repetition of the rumor,—not on the more basic field factor of the underlying anxieties (Kris) or ambivalence (Bartlett) awaiting an answer, any answer, even if it be but a rumor.

That American psychologists find people less rational than they might be, in scientific experiments on suggestion, prestige and aspiration, cannot be laid entirely to cultural predilections, their subjects' or their

own (Mannheim). For it is an often complex world that man must fathom; and there are severe limitations in our tools and capacities, both individual and group; and there are the distorting emotional factors which are given such strong root in us in earlier years, when we are especially incompetent to assume fully rational responsibility;—and finally there are the often unmanageable social conditions and traditions dominating the spirit of the state, of the governing authorities. It is to this last factor, the quality of the mass communication of our government, that Katona has here made a concrete contribution, in his practical suggestions for an ultimately more democratic responsibility in the fight against inflation.

(Pvt.) JOSEPH SHOR
Mental Hygiene Unit, ESCRTC, Fort Monmouth, N. J.

SORIA, TEODORO D. Psicología. Fifth edition, revised and enlarged by Augustín Mateos. Mexico City: Porrúa Hermanos y Cía., 1942. Pp. 284.

Since a half-century ago, when Oswald Külpe broke with the classificatory presentation of psychology, it has been the style to restrict textbooks to the somewhat spotty data of adventitious experimentation. It is therefore instructive to learn, as from Soria's work, what can be done with classification when used as an approach to modern facts and concepts. His book represents a tour of the field of general psychology rather than a series of side-trips to the better-publicized points of interest. One immediate effect is the preservation of a unity of subject-matter which informs the student clearly as to the scope of psychology among other theoretical interpretations of reality.

Another effect is the clarification of psychology as a *point of view*. Specifically, the debt of psychology in its implications to such thinkers as Descartes and Kant is plainly set forth, and the validity of this despite the philosophical ignorance of any individual psychologist is emphasized. Such effects are due not to any partisan interest in philosophy but to the approach by classification of subject-matter and pursuant analysis into the details.

After relating the scope of psychology to its (by no means exclusive) rooting in the nature of consciousness, and presenting the various methods of psychology, the author proceeds to a closer examination of consciousness and attention. Here the special flavor which he imparts appears in a subsequent discussion of psychical *acts*. The reader to whom Franz Brentano is a half-forgotten name may be impressed by the novelty, in a day of objective functionalism, of Soria's use of act-psychology, and he should be impressed by the virility of its concepts. Thus the topic of sensation is introduced, to be followed by perception, images, memory, imagination, thought and judgment. Presentation of affective activity leads to the treatment of emotions, instinct, habit, will, the self, and character and personality. The motivational aspect draws upon Ribot and Janet. The last two of the 31 chapters are devoted to "psychical states," including dreams, suggestion, hypnosis, etc.

The book reminds one of a review outline, in that extended treatment of any particular item is made impossible by its plan. The author has a gift for summarizing the point of a theory in a sentence, and in connection with any topic all considerable theories are regularly included. Unfortunately, bibliographical references are entirely lacking, and there is no index. Such a book, however, lends itself to use as a central text to be elucidated through lectures and special reading.

Its popularity in Spain carried it through three printings before the author's death. Two further and revised editions, produced by the present editor for Spanish-American use, testify to the continued demand. An accurate description is set forth in the statement that it is "a complete and simple synthesis of present-day psychological knowledge." The uniform clarity of style is not the least of its achievements.

HOWARD DAVIS SPOERL.

American International College.

BOOKS AND MATERIALS RECEIVED

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BOND, G. L., & BOND, EVA. Teaching the child to read. New York: Macmillan, 1943. Pp. ix+356.

BRECKENRIDGE, MARIAN E., & VINCENT, E. LEE. Child development, physical and psychological development through the school years. Philadelphia: Saunders, 1943. Pp. ix+592.

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HARRELL, RUTH FLINN. Effect of added thiamine on learning. Teach. Coll. Contr. Educ., No. 877. New York: Bur. Publ., Teachers Coll., Columbia Univ., 1943. Pp. v+55.

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REMMERS, H. H., & GAGE, N. L. Educational measurement and evaluation. New York: Harpers, 1943. Pp. ix+580.

RUNES, D. D. (Ed.). Twentieth century philosophy. New York: Philosophical Library, 1943. Pp. 571.

WOLFF, W. The expression of personality. New York: Harpers, 1943. Pp. 334.

YERKES, R. M. Chimpanzees: a laboratory colony. New Haven: Yale Univ. Press, 1943. Pp. xv+321.

YOUNG, P. T. Emotion in man and animal. New York: John Wiley, 1943. Pp. xiii+422.

———. Psychology for the fighting man. Committee of the National Research Council with the collaboration of Science Service, Washington: The Infantry Journal, 1943. Pp. 456.

NOTES AND NEWS

Agnes Low Rogers died, July 16, at the age of fifty-eight years, in Angus, Scotland. Dr. Rogers has been an instructor in English (1906–08) at St. Andrews University (Scotland), and lecturer in logic, ethics, and psychology at Aberdeen University (Scotland), (1911–14). Coming to the United States in the latter year, she served as an assistant and lecturer in educational psychology, Teachers College, Columbia University (1915–18); as professor of education, Goucher College (1918–23); as professor of education, Smith College (1923–25); and as professor of psychology and education, Bryn Mawr College, 1925–27. She was the author of "Experimental Tests of Mathematical Ability and their Prognostic Value" (1918), and of many papers on philosophical, psychological, and educational subjects.

The establishment of a new loan fund at Ohio University to be known as the James P. Porter Loan Fund in Psychology was announced recently by Dr. A. C. Anderson, professor of psychology, who headed a committee to formulate plans to honor Dr. Porter upon his recent retirement from the teaching faculty. The money for the loan fund was contributed by former students and by members of the psychology department staff. At a dinner, Dr. Porter was presented with a book of letters from former students. Dr. Porter, who came to Ohio University as professor of psychology in 1922, retired from teaching and was elected professor emeritus on July 30 of this year. For many years Professor Porter was editor of the *Journal of Applied Psychology.*

Donald G. Marquis has been appointed Director of the Office of Psychological Personnel, to succeed Steuart H. Britt, who has been commissioned in the Navy. Mrs. Jane D. Morgan has been appointed Assistant to the Director.

Austin H. Riesen, assistant professor of psychology at Yale University and research assistant in the Infant Studies Program of the Yerkes Laboratories of Primate Biology, Orange Park, Fla., has been granted leave of absence to enter the Army Air Corps as First Lieutenant at the School of Aviation Medicine, Randolph Field, Texas.

Elaine F. Kinder, chief psychologist at Rockland State Hospital, Orangeburg, New York, has been given a year's leave of absence to undertake research with the Infant Studies Program at the Yerkes Laboratories of Primate Biology, Orange Park, Fla. Angela Folsom has been appointed acting chief psychologist in charge of the psychology department at Rockland State Hospital during Dr. Kinder's absence.

Saul Rosenzweig, formerly research associate in psychology at the Worcester State Hospital and assistant professor (affiliate), Clark University, on July 1, 1943, became chief psychologist at the Western State Psychiatric Hospital, Pittsburgh, Pennsylvania, with a teaching affiliation in the department of psychology at the University of Pittsburgh. The Western State Psychiatric Hospital has been recently opened as a re-

search and training institute under the direction of Dr. Grosvenor B. Pearson. Its department of psychology includes besides Dr. Rosenzweig, LOURENE E. BUNDAS, psychologist; KELLY LUMRY and HELEN DAVIDSON, assistant psychologists. Plans are being made for establishing this fall several psychological internships which may be combined with graduate work at the University. Applications may be addressed to the director of the Hospital.

E. N. BARNHART, formerly in charge of the motion picture content analysis of the Bureau of Intelligence of OWI is now working in the Office of Strategic Services, Washington, D. C.

JAMES H. ELDER, of the department of psychology of the Louisiana State University, has leave of absence to enable him to serve as psychologist in the office of the chief signal officer of the War Department, Washington, D. C.

HERMAN G. CANADY, has been promoted to a full professorship in psychology and philosophy at West Virginia State College (Institute, W. Va.)

WARD C. HALSTEAD, assistant professor of experimental psychology, Department of Medicine, University of Chicago, was elected to associate membership in the American Neurological Association at its recent New York meeting.

STEPHEN HABBE has joined the staff of the Life Insurance Sales Research Bureau in Hartford, Conn.

Wilson College on May 31st conferred the honorary degree of doctor of science on DR. GERTRUDE RAND, research associate in Ophthalmology on the Knapp Foundation, College of Physicians and Surgeons. Columbia University.

STANLEY G. DULSKY has been appointed Assistant to the Director of Job Training, Stromberg-Carlson Co., Rochester, N. Y.

DONALD R. GORHAM, head of the department of Christian education, Eastern Baptist Theological Seminary, Philadelphia, has been appointed professor of education and psychology, Keuka College (Keuka Park, N. Y.) and will also serve as director of the bureau of placement.

Recent appointees to the Delaware Division of Special Education and Mental Hygiene are: Mrs. RUTH LANE, psychoeducational examiner and audiometrician for the southern part of the state; Miss ELEANOR WIRTH, lip-reading teacher for the Wilmington area; Mrs. MURIEL MITCHELL, speech correctionist for Wilmington, and Miss FLORENCE RICHARDS, formerly of the Woods School, teacher of a special class for the mentally retarded in Wilmington. Mrs. CATHARINE L. HULTSCH continues as psychoeducational examiner in the Wilmington Schools, while VIRGINIA WALLIN'S work as psychoeducational and audiometric examiner will cover the area between Dover and the Pennsylvania

border. Dr. J. E. W. WALLIN is serving as chairman of the Delaware Committee on Problems Affecting the Hard of Hearing, of the Committee on Handicapped Children of the Wilmington Community Council on Youth, and of the Delaware Council on the Handicapped.

The Philosophical Library has agreed to sponsor the publications of a *Yearbook of Psychology*, the initial volume to be published early in 1944. The plans call for a scholarly volume which will present the significant trends, developments, and research in contemporary psychology. Contributions in the form of original articles or reprints are invited. Communications should be addressed to the Editor, PHILIP LAWRENCE HARRIMAN, Bucknell University, Lewisburg, Pa.

The Indiana Academy of Science, invites Indiana psychologists, whether members of the Academy or not, to submit abstracts for 10 minute papers which have practical implications for winning the war or for post-war reconstruction to be presented at the Indianapolis meeting October 28, 29, and 30. Abstracts in form suitable for publication should be sent to the chairman of the Psychology Section, W. A. KERR, Personnel Planning and Research, RCA Victor Division, Radio Corporation of America, Camden, N. J.

The Executive Council of the American Society for Aesthetics met at Columbia University on May 23d, and completed the organization of the Society by adopting a constitution. Two types of membership were established: active and associate. The latter is open without restriction to all who are interested in theoretical studies of the arts and related fields. The former is restricted to persons actively working along these lines, who have demonstrated mature ability and achievement therein. Annual dues for either type are three dollars, and applications for membership or information are to be sent to the Secretary-Treasurer.

The aim of the Society was stated as "promoting study, research, discussion, and publication in aesthetics." "Aesthetics" is understood to include "all studies of art and related types of experience from a philosophical, psychological, scientific, historical, critical, or educational point of view, with emphasis on general aspects and interrelations." The term "art" is to include all the arts—fine and applied; visual, literary, and musical, theater, dance and film, as well as painting, sculpture, and architecture.

Officers and members of the Council are as follows: *President*, THOMAS MUNRO, The Cleveland Museum of Art, Cleveland, O.; *Vice-president*, VAN METER AMES, University of Cincinnati, Cincinnati, O.; *Secretary-treasurer*, MAX SCHOEN, Carnegie Institute of Technology, Pittsburgh, Pa.; GEORGE BOAS, CURT J. DUCASSE, IRWIN EDMAN, KATHARINE GILBERT, THEODORE M. GREENE, STEPHEN C. PEPPER, CARROLL C. PRATT, and RALPH B. WINN.

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Psychological Bulletin

RECOMMENDATIONS OF THE INTERSOCIETY CONSTITUTIONAL CONVENTION OF PSYCHOLOGISTS

I. Statement of the Joint Constitutional Committee of the APA and the AAAP

On the following pages are presented the By-Laws proposed for a reconstituted American Psychological Association, together with a statement prepared by the Continuation Committee of the Intersociety Constitutional Convention. These By-Laws were originally prepared by the Continuation Committee, which was charged with the responsibility of putting the recommendations and deliberations of the Convention into the form of By-Laws for presentation to the constituent societies. The By-Laws submitted by the Continuation Committee were discussed at length by the Council of Directors of the American Psychological Association and by the Board of Governors of the American Association for Applied Psychology and were transmitted to the business meetings of the respective associations at Northwestern University, Evanston, Illinois, September 1 and 2, 1943. Both Associations approved the proposed By-Laws in principle and authorized their transmission to the membership. A joint constitutional committee was established by the two societies which was to incorporate the modifications and revisions suggested by the governing boards and the business meetings and then submit the revised By-Laws to the memberships of the two associations for comment and suggestions prior to the circularization of the memberships in the Spring of 1944 for the final mail vote.

In taking the responsibility for these revisions, prior to the final vote, the two societies are acting in accordance with the instructions given by the Convention which, in Article XVIII, limited initiating action to these two societies. Expressions of opinion are, however, being sought from all psychologists, irrespective of their society membership.

A very important question upon which the assistance of psychologists is sought is found in the Divisional structure of the pro-

posed society. The sample ballot on page 646-47 has been prepared by the Joint Committee and will be submitted by mail at a later date. At the same time all psychologists will be urged to send in suggestions, criticisms and comments for the guidance of the Joint Committee in their revisions.

This is the first general circularization of the By-Laws. In the Spring of 1944, after revision in accordance with the suggestions received, the membership of the societies will again be circulated for a mail vote of acceptance or rejection. The results of this vote will be presented at the meetings of the societies in the Fall and become the basis for such final action as may be taken.

The Joint Committee will appreciate early and careful reading of the proposed By-Laws, discussion of their contents and implications among groups of psychologists, and the prompt return by individual psychologists of the Survey of Opinion with comments and criticisms on the By-Laws, when the blank is circulated. All correspondence should be addressed to the Secretary of the Joint Committee: Dr. C. M. Louttit, 4606 Cheltenham Drive, Bethesda (14), Md.

Respectfully submitted,
THE JOINT CONSTITUTIONAL COMMITTEE,

FOR THE AMERICAN PSYCHOLOGICAL ASSOCIATION

John E. Anderson
Willard L. Valentine
Ernest R. Hilgard, *Chairman Joint Committee*

FOR THE AMERICAN ASSOCIATION FOR APPLIED PSYCHOLOGY

Alice I. Bryan
C. M. Louttit, *Secretary Joint Committee*
Sidney L. Pressey

RECOMMENDATIONS OF THE INTERSOCIETY CONSTITUTIONAL CONVENTION OF PSYCHOLOGISTS

II. Statement by the Continuation Committee of the Convention

The Convention met in New York City, May 29–31, 1943. All but one of the twenty-six delegates or their alternates were present throughout the three days of sessions.

While nearly all the Delegates were initially in favor of some sort of communalization of psychological effort in America, there was at first a considerable divergence of views. The early discussion brought out preferences for (1) a loose federation of societies supporting a common secretarial office, (2) such adaptation of the present By-Laws of the American Psychological Association as would render that society adequate to American psychological activities, and (3) the formation of a new society to replace all the old ones.

As the discussion advanced, the Delegates came gradually into substantial agreement, finding that a loose federation would not accomplish their purposes and that an entirely new society would be impracticable. They voted: "It is the sense of this Convention that we accept the principle of an ideal unified organization, but believe that it can be best accomplished by a reconstitution of the existing national societies."

It presently became obvious to the Convention that the new society must combine the functions and atmospheres of the American Psychological Association and the American Association for Applied Psychology, leaving room for the inclusion of the Psychometric Society and the Society for the Psychological Study of Social Issues. It did not appear that the other societies would find it practicable to be included within the new society except by affiliation.

It also became clear that the new organization must be centered about functional interest-groups and remain flexible as to its degree of centralization and decentralization. The present plan, which is recommended herewith, was devised to create autonomous Divisions for every existing interest-group which wishes to function as a whole, whether it be small or large (fifty members or more), and to leave these Divisions free to delegate to the Central Office of the Association such functions as that Office may carry

on more economically, or to withdraw these functions from the Office when the Divisions so desire. By assigning only the general functions to the new society and reserving all specific rights to the individual sections, with power to delegate them, the Convention thought to secure democracy in law and efficiency in fact. Herein lies the basic philosophy of the present recommendations.

The Convention was ultimately forced to the conclusion that this new society could be realized only by a reconstitution of the present structure of the American Psychological Association in such a way that it include within its expanded structure the functional interests and professional atmosphere of the American Association for Applied Psychology. The Convention recommends, therefore, a *de facto* amalgamation of these two societies under new forms and a *de jure* continuation of the older society, with its appropriate name, its prestige and also with the commitments which deeds of gift have placed upon it. The flexible form which results from these recommendations also provides amply for the adherence of the two other important societies mentioned above.

It is possible to regard these recommendations either as a merger of societies in a new society or as a reorganization of the American Psychological Association to include the interests and functions of the other societies. The Convention urges upon the memberships of the societies the recognition of the fact that these two expressions of the change are actually identical in meaning.

The Convention in session prepared a set of By-Laws and made many recommendations concerning them. It then appointed a Continuation Committee to redraft the By-Laws. This Committee, acting through correspondence, revised the By-Laws once and secured from all the Delegates but two (who did not reply before the dead-line set) approval and suggestions for changes. The Committee then met in New York on August 7–8, 1943, and took account of the Delegates' suggestions, criticized their own work and prepared the present draft, which it submits to the societies.

Since the principles of this draft have already been approved by the Delegates, it is expected that the Delegates will make such special representations as they desire to their respective societies in support of these recommendations.

The Convention authorized this form of explicit recommendation, because the presentation of principles without specific implementation would have left agreement among the constituent societies practically impossible.

This draft is now being sent to the Delegates and to the Officers of the constituent societies with recommendations that the societies adopt it. A tremendous amount of work has already gone into its preparation—somewhat more than one thousand man-hours of discussion, correspondence and verbalization. Some modifications of statement are still needed; opportunity will be provided for these before final enactment.

The Convention recommends that the new form of organization be established as soon as it has been accepted by the American Psychological Association and the American Association for Applied Psychology, with opportunity for the other societies to adhere.

The Continuation Committee supposes that the governing bodies of the constituent societies will make recommendations to their business meetings in September, 1943, and secure authorization to circulate these By-Laws to their memberships during the following year. It hopes that the American Association for Applied Psychology can secure adoption of the new plan by the Summer of 1944, that the American Psychological Association can secure moral sanction for it by a mail vote of its members so that it can formally adopt it in September, 1944, even though there be but a skeleton business meeting at that time. In that case, the year 1944–45 would become a transition year during which elections of the new Council of Representatives and other new officers could be completed, so that the new organization could begin to serve in 1945–46.

THE CONTINUATION COMMITTEE
GORDON W. ALLPORT
JOHN E. ANDERSON
EDWIN G. BORING
EDGAR A. DOLL
ALICE I. BRYAN, *Secretary*
ERNEST R. HILGARD, *Chairman*

RECOMMENDATIONS OF THE INTERSOCIETY CONSTITUTIONAL CONVENTION OF PSYCHOLOGISTS

III. By-Laws Appropriate to a Reconstituted American Psychological Association

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ARTICLE I

Object

1. The object of the American Psychological Association shall be to advance psychology as a science, as a profession, and as a means of promoting human welfare.

ARTICLE II

Membership

1. The Association shall consist of three classes of members: Fellows, Associates, and Life Members.

2. Fellows of the Association shall be persons who are primarily engaged in the advancement of psychology as a science and as a profession, and who have met standards of proficiency as described below. Fellows shall be entitled to all the rights and privileges of the Association without restriction. (All those now Members of the existing APA and those now Fellows of the existing AAAP shall be Charter Fellows of the Association.)

3. Associates shall be persons who are interested in the advancement of psychology as a science and as a profession, and who are either in train-

ing or in practice in psychology or a field of closely allied interest. Associates shall be entitled to all the rights and privileges of the Association, except those specifically denied them in these By-Laws. (Present APA Associates and AAAP Associates shall be Charter Associates.)

4. Life Members shall be persons who, having reached the age of sixty-five years and having been Associates or Fellows of the Association for at least twenty years, request such status. Although Life Members shall be exempt from paying dues, they shall retain all other rights and privileges of the Association except that of receiving journals covered by membership subscriptions. They may subscribe for such journals, if they so desire, at the rate paid by the Association for active members. (Life Members of the existing APA shall retain their status as Life Members. In counting the years of membership in the Association, years in the present APA or AAAP shall be counted.)

5. In addition to the regular membership classes, there shall be two classes of affiliates who are not members of the American Psychological Association, and shall not represent themselves as such unless and until they have met the membership requirements for Associates or Fellows and been elected to membership. These two classes shall be, first, Student Affiliates; second, Division Affiliates.

6. Student Affiliates shall be graduate students or undergraduate students majoring in psychology or related fields. Student affiliates shall have such rights and privileges as may be granted by the Council of Representatives, including special rates for journal subscriptions.

7. Division Affiliates shall be persons who belong to a Division of the Association but who do not hold membership in the Association itself. A Division may include those who are competent in related fields but who either do not qualify for Association membership or do not wish such membership.

8. Fellows and Associates shall be elected by a majority vote of the Council of Representatives present at any annual business meeting, upon nomination of the Board of Directors. Affiliates are recognized by the Executive Secretary without election upon securing the necessary endorsements and the paying of fees.

9. The minimum standards for Fellowship shall be (1) a Doctor's degree based in part upon a psychological dissertation conferred by a graduate school of recognized standing, except when waived in special cases by the Council of Representatives, (2) prior membership as an Associate, and (3) either acceptable published research of a psychological character beyond the doctoral degree, or four years of acceptable professional experience subsequent to the granting of the doctoral degree. The Council of Representatives shall have the power to designate further standards to be met in the election of Fellows. Divisions may require higher standards than those set by the Council for the Association as a whole. Nominations for Fellow must include: (1) evidence that the minimum Association standards have been met, and (2) recommendation by one of the Divisions of the Association, specifying the designation to be used. Except for Charter Fellows, who shall continue as such unless recommended by a Division for designation, all Fellows shall be designated by the name of the Division so specifying them; (e.g. Fellow in Industrial Psychology,

Fellow in Physiological Psychology, Fellow in Abnormal and Clinical Psychology).

10. Divisions may establish such classes of membership within the Division as they see fit, except that the designation Fellow shall be reserved for members of the Division who are also members of the Association and elected as Fellows according to the provisions of Section 9.

11. Associates shall be (1) persons who have completed at least two years of graduate work in psychology in a recognized graduate school or one year of graduate study plus a year of experience in professional work that is psychological in nature and who, at the time of application, are devoting full time to professional or graduate work that is primarily psychological in nature; or (2) be persons with the Doctor's degree based in part upon a psychological dissertation and conferred by a graduate school of recognized standing; or (3) be scientists, educators, or other distinguished persons whom the Board of Directors may recommend for sufficient reason.

12. Any Fellow, Associate, Student Affiliate, or Division Affiliate may be expelled for cause by an affirmative vote of two-thirds of the members of the Council of Representatives present at any annual business meeting. Such vote shall be taken only upon recommendation of the Committee on Scientific and Professional Ethics, after that committee has given the member or affiliate an opportunity to appear before it to answer the charges against him, and after the Committee's recommendations have been reviewed and approved by the Board of Directors.

13. Procedures for application for membership and affiliateship in the Association and for transfer from Associate to Fellow shall be prescribed by the Council of Representatives.

ARTICLE III

Divisions

1. The special interests that lie within the Association shall be represented by Divisions.

2. Every member of the Association shall be a member of at least one Division and may become a member of other Divisions under the rules of eligibility and election established by them.

3. Members of the Association not expressing a preference for a special Division shall be members of a Division of General Psychology.

4. A Division shall be set up whenever fifty or more Associates and Fellows of the Association petition for it and the Council of Representatives approves. A two-thirds vote of those present at any annual business meeting of the Council of Representatives is required for the establishment of a new Division. The Council will act favorably on such petitions whenever they represent the emergence of an active and functionally unitary interest of a group of members, provided only that the interest falls within the scope of the Association as defined in Article I and that the establishment of the Division is not inimical to the welfare of any other Division already established. Divisions when formed from existing societies or organized as new societies may use a society name, provided they append to it the phrase: "A Division of the American Psychological Association."

5. A Division may be dissolved on a two-thirds vote of those present at an annual business meeting of the Council of Representatives (1) when the number of Associates and Fellows within the Division falls below fifty, or (2) when two-thirds of the total membership of the Division recommend dissolution. The Council may also dissolve a Division (3) for good and sufficient reason, provided the reason for dissolution is stated in writing by the Council to the membership of the Division.

6. A Division remains autonomous in all matters within its field that are not reserved to the Association and the Council of Representatives by these By-Laws. It determines its own qualifications for its membership classes and it determines what persons among its membership shall have the right to vote in Divisional matters.

7. The elected Representatives of a Division on the Council of Representatives shall be members of the Association, and shall be chosen by and only by the members of the Division who are also Associates or Fellows of the Association.

8. A Division shall have at least a Chairman (or President) and Secretary, and may have such other officers as it may desire. The qualifications for the Chairman (or President) and Secretary shall be determined by the Division, and the method of their election shall be considered a Divisional matter, except that the Chairman (or President) and Secretary shall be members of the Association.

9. Each Division shall draw up its own By-Laws and rules of procedure within the framework of these By-Laws, and not inconsistent with these By-Laws. Each Division may elect such officers and appoint such committees, in addition to those prescribed in these By-Laws, as it may deem necessary for the conduct of its business, and may adopt such regulations outlining the duties of its officers, the Division Council, and committees as it may desire, except that its committee structure is subject to review by the Committee on Committees of the Association (Article X). A committee proposed by a Division which is more properly a committee of the Association may become a special committee of the Association on recommendation of the Committee on Committees. Each Division shall file with the Recording Secretary of the Association a copy of its By-Laws and regulations.

10. A Division may administer a journal or special funds allocated to its use, but may delegate such administrative functions to the Council of Representatives or to the Central Office.

11. The charter Divisions* of the Association shall be:

(For the final vote, there will follow here, the list of divisions as prescribed by the Joint Committee of the APA and the AAAP as a result of the "Survey of Opinion on Matters Affecting the By-Laws," which will be circulated among the members of the two Associations.)

ARTICLE IV

Council of Representatives

1. The Representatives of the Divisions, the Chairmen and Secretaries of the Divisions, Regional Representatives, Representatives of the

* If certain of the participating societies, such as the Psychometric Society or SPSSI. wish to come in as Divisions they will be among the Charter Divisions.

Board of Affiliates and Special Representatives, together with the officers of the Association, including the President, the President-Elect, the Recording Secretary and the Treasurer, shall constitute the Council of Representatives of the Association. The President of the Association shall preside at the meetings of the Council of Representatives and, in his absence or disability, the President-Elect shall preside. Representatives and officers on the Council shall hold office until their successors are elected and qualify.

2. The Council of Representatives shall be the legislative body of the Association and shall have full power and authority over the affairs of the Association within the limitations set by these By-Laws. It shall have the authority to elect members and to expel members. It shall have the power to make such contracts and to provide for the delivery of such deeds, documents, and instruments as shall be necessary for the carrying out of all the purposes, functions and business of the Association as provided by these By-Laws. It shall decide all questions involving cooperation with other national organizations and may make such changes in policy or administration as it deems advisable, consistent with these By-Laws. It may recommend amendments to the By-Laws. It shall have the authority to delegate powers and responsibilities to the Board of Directors, the Board of Publications and the Policy and Planning Board, in addition to those already designated by these By-Laws.

3. Regular business meetings of the Council of Representatives shall be held in September of each year, the time and place of the meeting to be decided by vote of the Council. Special meetings may be called by vote of the Board of Directors, and shall be called upon the written request of ten members of the Council. Notices of meetings, in writing, for every annual or special meeting of the Council of Representatives shall be prepared and mailed to the last known post office address of each Representative not less than fifteen days before any such meeting, and, if for a special meeting, such notices shall state the object or objects thereof, and no business shall be transacted except that stated in the notice for said special meeting. The Council of Representatives shall publish its minutes and proceedings in the official journal of the Association. On important matters of policy, the minutes shall include a record of those Representatives voting for and against a motion. Any vote shall be recorded if one-fourth of the Representatives present so request. Meetings of the Council of Representatives, except those specifically designated as Executive sessions, shall be open to members of the Association.

4. In addition to those who are Representatives on the Council because they are officers of Divisions or of the Association, there shall be four classes of Representatives: first, Representatives of Divisions; second, Regional Representatives; third, Representatives of the Board of Affiliates; fourth, Special Representatives.

5. Representatives of a Division, who shall be members of the Division and of the Association, shall be elected by those members of the Division who are also members of the Association. Representatives of a Division shall be elected annually, but their renomination shall be auto-

matic for two succeeding elections, provided they retain membership in the Association and the Division. Renomination shall not be permitted after three years on the Council without at least one year intervening.

6. The number of Representatives which any one Division shall have on the Council in addition to the Division Chairman and Secretary is determined annually in accordance with the number of members within the Division who are members of the Association. Total representation shall be determined as follows:

Members of the Division who are Associates or Fellows of the Association	Number of Representatives on the Council (in addition to Chairman and Secretary)
200 or less	None
201 to 400	1
401 to 600	2
601 to 800	3
801 and over	4

7. If the same person should be elected as Representative of more than one Division he may serve in such dual capacity, except that he shall count as only one in determining a quorum or in any vote of the Council.

8. There shall be nine Regional Representatives elected for a term of three years, one from each of the following regions:

I. *New England:* Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont.
II. *Middle Atlantic:* Delaware, District of Columbia, Maryland, New Jersey, New York, Pennsylvania.
III. *East North Central:* Illinois, Indiana, Michigan, Ohio, West Virginia, Wisconsin.
IV. *West North Central:* Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota.
V. *Southeastern:* Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia.
VI. *Southwestern:* Arizona, Arkansas, Louisiana, New Mexico, Oklahoma, Texas.
VII. *Rocky Mountain:* Colorado, Idaho, Montana, Wyoming, Utah.
VIII. *Pacific:* California, Hawaii, Nevada, Oregon, Washington.
IX. *Dominion of Canada.*

The Regional Representatives shall be elected by preferential mail ballot of members resident in the region at the time of election. Nomination shall be by the members resident in the region, in accordance with the provisions of Article VIII. (In order to place into effect, during the first year the Regional Representatives for Regions I, IV, and VII shall be elected for a term of one year, those for Regions, II, V, and VIII for a term of two years, and those for Regions III, VI, and IX for a term of three years.)

9. The Board of Affiliates shall be represented on the Council of Representatives by its Chairman, by its Secretary, and by one additional representative for each five societies or fraction thereof above the first ten.

10. The Council may at its discretion propose Special Representatives of groups not qualifying as Divisions of the Association, but with reason to be represented by virtue of relation to the objectives of the Association, except that there shall not at any one time be more than three such Representatives, and no group shall have more than one such Representative. Special Representatives shall be elected annually by the group specified by the Council, subject to renomination and re-election according to the practice for Representatives of Divisions (Section 5 above). Special Representatives must be members of the Association, but those who elect them need not be. (It is specified that a Special Representative of teachers of psychology in Negro institutions of higher learning shall be included, if the organization of this group so elects.)

11. Upon petition of 100 members in good standing at the time of the petition's filing with the Recording Secretary, or upon majority vote of any duly constituted Division, any matter of legislation may be brought to the attention of the Council of Representatives, which shall vote upon it at its next regular meeting.

12. Upon petition of 200 members in good standing at the time of the petition's filing with the Recording Secretary, a request for a mail vote of the members of the Association upon a question of policy or legislation—either concerning a past action to be recalled or a new action to be initiated, but not involving an Amendment to the By-Laws—may be addressed to the Council of Representatives, which shall present the matter covered by the petition, if it is not inconsistent with the By-Laws, to the members of the Association for a mail vote on an appropriate ballot which shall present the legislation proposed and which may contain arguments for and against the legislation. The results of such a vote shall be counted by the Election Committee. When the Election Committee certifies the result to the Council of Representatives, the latter shall, if there is a majority of those voting in favor, make the legislation operative. (For Amendments to the By-Laws, see Article XVII.)

13. A majority of the members of the Council of Representatives shall constitute a quorum.

14. The Council of Representatives shall be authorized to adopt and publish rules and codes for the transaction of its business, provided they do not conflict with these By-Laws.

ARTICLE V

Board of Directors

1. The Board of Directors shall consist of the President, the President-Elect, the Recording Secretary, the Treasurer, and six others elected by a preferential ballot by the Council of Representatives from among its own members. Directors shall serve for terms of three years and their term of service on the Board of Directors may outlast their membership in the Council of Representatives. All members of the Board of Directors shall serve until their successors are elected and qualify. (In order to place into effect staggered terms for the six Directors, at the first election two shall be elected for one year, two for two years, two for three years.)

2. Regular meetings of the Board of Directors shall be held semi-annually; one just prior to the annual business meeting of the Council of Representatives in September, the other approximately six months later, at a time and place to be specified by vote of the Board of Directors. Special meetings of the Board of Directors may be held at any time on the call of the President or the Recording Secretary. A quorum at any meeting shall consist of a majority of the entire membership of the Board of Directors.

3. In the case of disability or resignation of a Director, the Council may fill the vacancy for the unexpired term.

4. The Board of Directors shall be the administrative agent of the Council and shall exercise general supervision over the affairs of the Association. It shall nominate new Fellows and Associates, and shall make recommendations concerning the administration of the Association to the Council. It shall transact all business referred to it by the Council, provided, however, that the action of the Board shall not conflict with recorded votes of the Council of Representatives or these By-Laws. The Board of Directors shall supervise the work of the Executive Secretary and other employees of the Association. In the interval between annual elections, the Board of Directors shall have the power to fill vacancies created by the death, disability, or resignation of elected representatives to other organizations. In the interval between the annual business meetings of the Council of Representatives, the Board of Directors shall have authority over the affairs of the Association and shall take such actions as are necessary for the conduct of the Association, except that no action shall be taken which is contrary to an action taken by the Council of Representatives at its annual business meeting or which is inconsistent with these By-Laws. The Board of Directors shall make a report of its transactions at each regular meeting of the Council of Representatives.

5. If an emergency arises between annual meetings of the Council of Representatives, the Board of Directors shall have the power to change plans for meetings, to expend such funds, and to take such other actions in the name of the Association as it may deem necessary and wise, provided, however, that no action shall be taken under this emergency clause until an affirmative vote of two-thirds of the members of the Council of Representatives declaring that an emergency exists be secured and provided that all actions so taken be recorded and made available at the next succeeding meeting of the Council of Representatives and that all financial transactions shall pass through the Treasurer's office and be recorded and audited in accordance with these By-Laws and that nothing in this section be understood to delegate to the Board of Directors power to alter the procedure prescribed in these By-Laws for the election of officers. In connection with an interim or emergency action, the Board of Directors may secure a mail vote of the Council of Representatives.

6. The President of the Association shall be Chairman of the Board of Directors, and the Recording Secretary of the Association shall be Recording Secretary of the Board of Directors. The Executive Secretary of the Association and other employees may be invited to sit with the Board of Directors on appropriate occasions but shall have no vote.

ARTICLE VI

Officers

1. The officers of the Association shall be as follows: a President, a President-Elect, a Recording Secretary, and a Treasurer. They shall hold office until their successors are elected and qualify.

2. The President shall be the member of the Association who has just completed his term as President-Elect. The President-Elect shall automatically become President by declaration at the close of the annual meeting one year after announcement of his election as President-Elect. During his term of office the President shall serve as (a) general presiding officer of the Association, (b) Chairman of all meetings of the Council of Representatives, (c) Chairman of the Board of Directors. It shall be his duty to countersign all contracts and other instruments of the Association except checks, to exercise general supervision over the affairs of the Association and to perform all such other duties as are incident to his office or as may properly be required of him by vote of the Council of Representatives or Board of Directors at any duly constituted meeting. (In order to place these By-Laws into effect, the President shall be elected by preferential mail ballot prior to the first annual meeting by the members of the Association following primary nomination by mail ballot. He shall take office for a term extending from the beginning of the first annual meeting through the close of the next annual meeting. Thereafter the President-Elect shall become President according to the provisions of Section 2.)

3. The President-Elect shall be a member of the Association, elected by preferential mail ballot by the members of the Association following primary nomination by mail ballot. He shall take office as President-Elect at the close of the annual meeting at which his election is announced. During his term of office as President-Elect he shall serve as (a) member of the Council of Representatives and Board of Directors, and (b) vice-chairman of the Council of Representatives and Board of Directors. In the event that the President shall not serve out his full term for any reason, the President-Elect shall succeed to the unexpired remainder thereof and continue through his own term. The duties of the President-Elect shall be those of a vice-president.

4. The Recording Secretary shall be a member of the Association elected by the Council following nomination by the Board of Directors. He shall serve for a term of three years, beginning at the close of the annual business meeting at which his election is announced, and shall not succeed himself more than once in this office. During his term of office he shall serve as (a) member and secretary to the Council of Representatives, and (b) member and secretary of the Board of Directors. It shall be the duty of the Recording Secretary to keep the records of all meetings of the Council of Representatives and Board of Directors in due form as prescribed by law; to have charge of the seal and corporate books; to file and hold subject to call and to direct the publication of such records, reports and proceedings as are authorized by these By-Laws and by vote of the Council or Board of Directors at any duly constituted meeting; to bring to the attention of the Council and the Board of Directors such

matters as he deems necessary; to conduct the official correspondence of the Association; to have custody of the bonds which are required to be filed by the Treasurer and such other fiduciary employees as shall be required by the Board of Directors to file a bond, holding these bonds subject to the order and direction of the Board of Directors; to issue calls and notices of meetings; to sign such checks or other drafts upon the funds of the Association as may be necessary in case of the death or incapacity of the Treasurer, and the Recording Secretary is hereby authorized to sign such checks or drafts in such contingency; to execute, seal or deliver any contracts, deeds, instruments or other documents which he shall be required to execute, seal or deliver on behalf of the Association by the By-Laws, vote of the Council of Representatives or the Board of Directors; and in general to perform all such other duties as are incident to his office or as properly may be required of him by vote of the Council or Board of Directors at any duly constituted meeting. In the absence of any specific provision of these By-Laws to the contrary, the Recording Secretary shall have power and authority to represent the Association in the voting or other management of any stock held by the Association in any other corporation or company; and in the event that the performance of such acts by the Recording Secretary becomes impossible or inadvisable, by virtue of law or otherwise, the Recording Secretary shall have the power to appoint any member of the Association to act as duly authorized agent of the Association for the performance of said acts.

5. The Treasurer of the Association shall be a member of the Association elected by the Council following nomination by the Board of Directors. The Treasurer shall take office for a term of five years beginning at the close of the annual meeting at which his election is announced, and shall not succeed himself more than once in this office. During his term of office he shall serve as (a) senior fiscal officer of the Association, (b) member and fiscal officer of the Council of Representatives and Board of Directors, (c) fiscal representative of the members of the Association to the Central Office and to the Advisory Board on Publications. It shall be the duty of the Treasurer to have custody of all funds, deeds, stocks, securities including those of the Association's publications and to deposit the same in the name of this Association in such bank or banks as the Council or Board of Directors may direct; to have custody of all other property of the Association not otherwise expressly provided for by these By-Laws and to hold same subject to the order and direction of the Council; to collect subscriptions and other debts due the Association by all persons whatsoever; and to execute, seal or deliver any contracts, deeds, instruments or other documents which he shall be directed to execute, seal or deliver on behalf of the Association by the By-Laws, vote of the Council or Board of Directors. He shall have authority to sign checks and drafts on behalf of the Association for the disbursement of funds for the duly authorized purposes of the Association as provided by the By-Laws, vote of the Council or Board of Directors. He shall be bonded by an amount fixed by the Board of Directors, the bond to be filed with the Recording Secretary of the Association. He shall, at all reasonable times, exhibit his books and accounts to any member of the

Association. He shall keep a full and complete record of all money received and all money paid out, and shall perform such other duties as reasonably may be required of him by vote of the Council of Representatives or Board of Directors at a duly constituted meeting.

ARTICLE VII

Corporate Seal

1. The corporate seal of this Association shall be (here will be inserted a drawing of the corporate seal).

ARTICLE VIII

Nominations and Elections

1. A call for nominations for the office of President-Elect and Regional Representatives shall be issued by mail by the Election Committee to all members of the Association not later than March first of each calendar year. The nomination ballot shall provide spaces for at least three names to be listed in order of rank for each office to be filled. (Nominations for President shall be called for at the first election only.)

2. The Election Committee shall be responsible for the reporting of nominations and elections. The Chairman of the Election Committee shall report a preferential count of the nominees for President-Elect and Regional Representatives to the Recording Secretary not later than May first. The names reported shall be those receiving a large number of nominating votes, the number of names reported being determined by the Election Committee, but being at least four nominees for President-Elect and at least two for each Regional Representative to be elected. (A count of nominations for President shall be provided at the first election only.) The Chairman of the Election Committee shall report at the same time nominations from the Divisions, as transmitted to the Election Committee by the secretaries of the Divisions. Such nominations shall include nominations for Representatives of the Division to the Council of Representatives, and at the request of the Division may include Divisional officers. Divisional Representatives who have served less than three years shall be renominated automatically and designated as incumbents on the ballot, but additional nominations shall be provided so that there shall be at least two names for every position to be filled. It shall be the duty of the Election Committee to ascertain that each of the nominees is willing to stand for office; if nominees are unwilling to stand for office their names shall not appear on the election ballot, and other nominees shall be substituted if necessary to secure at least four nominees for President-Elect and at least two nominees for each other position.

3. The Recording Secretary then shall issue through the Central Office the appropriate election ballots not later than June first to all members of the Association.

4. The Election Committee subsequently shall report to the Board of Directors a preferential count of the election ballots for the office of President-Elect and Regional Representatives not later than August first.

The Election Committee shall secure reports from the secretaries of Divisions, and report their election results at the same time to the Board of Directors. Officers shall continue in office until the time provided in these By-Laws for their successors to assume office, provided the election of their successors has been reported to the Board of Directors in accordance with the above provisions; in case the procedure is not followed for any office, the incumbent shall remain in office until his successor is elected and qualifies.

5. Announcement of elections shall be made by the Board of Directors at the annual business meeting of the Council, and at the annual convention at the session on Report of the Council.

ARTICLE IX

Policy and Planning Board

1. The Council of Representatives shall elect, not necessarily from its own members, a Policy and Planning Board of nine persons, three of whom shall be elected each year, and each of whom shall serve for a term of three years. In the event of the incapacity or resignation of a member of this Board, the Council shall fill the vacancy for the unexpired term. (In order to place into effect, at the time of the first election, three members shall be elected for a term of one year, three for a term of two years, and three for a term of three years.)

2. The Policy and Planning Board shall represent all the active interests within the Association, so far as possible.

3. The Board's function shall be the consideration of current and long-range policy. As a continuing body, it shall recommend to the Council of Representatives such changes in existing policy and such extensions of the functions of the Association or its Divisions as shall promote the purposes of the Association and the usefulness of psychology in the furtherance of human welfare. The Board shall report annually in writing to the Council and by publication to the entire membership of the Association. It may also make recommendations *ad interim* when it deems them desirable.

4. The Board shall elect a Chairman and Secretary annually from its own membership.

5. The Board shall meet at least once each year at the call of its Chairman or Secretary.

6. The Policy and Planning Board shall review the structure and function of the Association as a whole in 1950 and in every fifth year thereafter and shall make appropriate recommendations to the Association.

ARTICLE X

Committees

1. The Committees of the Association shall consist of such standing committees as may be provided by these By-Laws and such special committees as may be established by vote of the Council of Representatives or the Board of Directors.

2. The Committee on Committees shall consist of five members chosen

by the Council of Representatives for terms of five years. It shall be the duty of the Committee on Committees to keep informed on the committee structure of Divisions of the Association, in order to avoid duplication, and to make recommendations concerning the Association committee structure and personnel. The formation of new committees by Divisions shall be subject to the approval of the Committee on Committees. Committees proposed by Divisions which appear to the Committee on Committees to deal with matters concerning the Association as a whole may be recommended as special committees of the Association, and may be appointed as such by the Council of Representatives. (In order to place into effect, at the time of the first election, one member of the Committee on Committees shall be appointed for a term of one year, one for two years, one for three years, one for four years, and one for five years.)

3. The Finance Committee shall consist of the Treasurer and four members chosen by the Council of Representatives. The Treasurer shall serve as Chairman. While the committee shall be elected annually, members may succeed themselves. It shall be the duty of the Finance Committee to present an annual budget, to supervise investments, and to nominate the professional auditors who shall be elected annually by the Council of Representatives.

4. The Convention Program Committee shall consist of five members appointed annually by the Board of Directors. It shall be the duty of the committee in conjunction with the Central Office to coordinate the Divisional programs and arrange for general scientific programs at the time of the Annual Convention.

5. The Committee on Scientific and Professional Ethics shall consist of four members chosen from different parts of the country for staggered terms of four years. Appointment to this committee shall be by vote of the Council of Representatives at its annual meeting on nomination by the Board of Directors. It shall be the duty of this committee to receive and investigate complaints of unethical conduct of Fellows, Associates, and Affiliates; to endeavor to settle cases privately; to report annually to the Council of Representatives on types of cases investigated with specific mention of difficult or recalcitrant cases; to recommend to the Council disciplinary action to be taken by the Association when in the Committee's judgment such action is justified and desirable; and to formulate from time to time rules or principles of ethics for adoption by the Association. (In order to place into effect, at the first election one member shall be elected for one year, one for two years, one for three years, and one for four years.)

6. The Election Committee shall consist of the three most recently retired Presidents of the Association, the most recently retired President acting as Chairman of the Committee. In case of the incapacity of a member of this Committee, the next most recently retired President, who is not already a member of the Committee, shall become a member of the Committee. It shall be the duty of the Election Committee to conduct and supervise the mail elections as provided in Article VIII of these By-Laws. (Until the system become established, the two most recently retired Presidents of the American Association for Applied Psychology and

the two most recently retired Presidents of the American Psychological Association shall function as the Election Committee, the most recently retired President of the American Psychological Association acting the first year as Chairman; in the second and third years the Committee for the preceding year shall elect the Chairman from among those of its own membership who are to continue.)

7. The Committee on Student Affiliates shall consist of five members chosen by the Council from different parts of the country for staggered terms of five years. It shall be the duty of this committee to represent the interests of the Student Affiliates, to encourage the organization of local groups, and to stimulate interest in the Association among those in training for the profession. This Committee may add student representatives to its own membership. (In order to place into effect, at the first election one member shall be elected for a term of one year, one for two years, one for three years, one for four years, and one for five years.)

8. The Committee on Public Relations shall consist of three members chosen by the Council for terms of three years. It shall be the duty of this committee to advise the Executive Secretary on matters pertaining to public relations. (In order to place into effect, at the first election one member shall be elected for a term of one year, one for two years, one for three years.)

9. All committees appointed by the Association shall submit, three weeks in advance of the annual business meeting of the Council of Representatives, a report in writing to the Recording Secretary, in order that the Council may discuss and act upon recommendations arising out of such reports.

ARTICLE XI

Affiliations and Branches of the Association

1. The Association shall encourage the organization of psychological societies and associations formed in accordance with general or special interests in psychology within geographical divisions of any size such as a region, a state or a city.

2. Within the Association there shall be a Board of Affiliates which shall represent the interests of the affiliated societies. It shall consist of one representative of each of the affiliated societies, who shall be elected to the Board by his society for a term of three years. The Board of Affiliates shall select a Chairman, a Secretary and such other officers from among its own membership as it deems necessary. It shall have the power to draw up such regulations for the conduct of its business as are not inconsistent with these By-Laws or the votes of the Council of Representatives. It shall report annually in writing to the Council of Representatives.

3. The Chairman of the Board of Affiliates shall preside at meetings of the Board and exercise general supervision over its affairs. He shall be elected by a majority vote of the Board for a three-year term and shall not be reelected for more than one term.

4. Any association or society with aims similar to those of the American Psychological Association may petition the Council of Representa-

tives for affiliation by submitting a statement describing its aims and purposes, together with copies of its By-Laws and lists of its officers and members. Upon the receipt of such a petition the Council of Representatives shall refer it to the Board of Affiliates for examination and recommendation, and shall act upon it at the next succeeding annual meeting. (All present geographical branches of the American Psychological Association, and all present affiliates of the American Psychological Association and of the American Association for Applied Psychology shall be granted affiliation with the reorganized American Psychological Association, if they request it.)

5. The conditions under which affiliation shall be permitted are as follows:

a. The Association shall assume no responsibility whatever for the administration or the financial affairs of affiliated organizations.

b. The responsibility for scientific programs rests with the affiliated organization except that, when meeting at the same time and place as the Association, the affiliated organization's program must be coordinated with that of the Association and its Divisions through the Convention Program Committee.

c. Each affiliated organization shall determine its own membership requirements and form of organization.

d. The Chairman (or President) and Secretary of an affiliated organization must be members of the Association.

e. Each affiliated organization shall exercise such control over its membership that membership in the affiliated organization shall not imply membership status in the Association.

f. The Executive Secretary shall include in the Yearbook such information about the affiliated societies, their members and officers, as may be deemed appropriate.

g. Each affiliated society shall pay an annual affiliation fee to the Association, the amount to be determined by the Council of Representatives.

6. In the event that the Council of Representatives believes that the conditions of affiliation are not being fulfilled by a given organization or that its affiliation is no longer to the best interest of the Association, the principal officers of the affiliated organization shall be so informed and the affiliation may thereafter be terminated by a two-thirds vote of the Council of Representatives.

7. The provisions of this Article, with the exception of Sections 5a, 5b, 5c, 5e, and 5f, above, shall not apply to societies or clubs formed by student affiliates who are under the jurisdiction of the Committee on Student Affiliates, as set up in Art. X, Section 7.

ARTICLE XII

Affiliations of the Association with Other Organizations

1. The Council of Representatives may establish affiliations with national and international scientific and professional organizations, may elect such representatives thereto as are necessary and proper, may

authorize the payment of appropriate fees for such affiliation, and may terminate such affiliations when they are not in the interest of the Association.

2. The Board of Directors shall nominate to the Council of Representatives for representatives of the Association in the Division of Anthropology and Psychology of the National Research Council double the number of names required. These names shall then be voted upon by the Council of Representatives, and the requisite number of names of members receiving the highest number of votes shall be presented to the Division of Anthropology and Psychology of the National Research Council as the Association's nominees for its representatives.

3. The names of members submitted by the Executive Committee of the Social Science Research Council shall be voted upon by the Council of Representatives. The name of the Member receiving the highest number of votes shall be presented to the Social Science Research Council as the Association's nomination for its representative.

ARTICLE XIII

Central Office

1. The Board of Directors shall maintain a Central Office for the conduct and promotion of the business of the Association and its Divisions in accordance with the advancement of psychology as a science, as a profession, and as a means of promoting human welfare. The functions of the Central Office shall include the administrative detail of the Association, the business management of publications, issuance of the yearbook, facilitation of personnel placement, promotion of public relations, and such other general and special services as are allocated to it by the Council of Representatives and the Board of Directors. Functions may be allocated to the Central Office by Divisions, provided they are consistent with these By-Laws. Details of arrangements between Divisions and the Central Office shall be cleared through the Board of Directors.

2. The Central Office shall be established at such a place and with such facilities as the Council of Representatives may direct.

3. The Board of Directors shall employ an Executive Secretary as the administrative agent of the Association and as managing director of the Central Office. The Board of Directors shall nominate to the Council for this appointment a candidate who shall be confirmed by a two-thirds vote of those present at a regular meeting of the Council.

4. The Executive Secretary shall be a member of the Association. He shall be employed by the Board of Directors for a term the length of which shall be determined by the Council of Representatives. During this term he shall not hold any office within the Association or any of its Divisions.

5. The Executive Secretary may be removed from office by a two-thirds vote of those present at a meeting of the Council of Representatives, if it appears that the best interests of the Association are not being adequately served by the incumbent.

6. A budget for the Central Office shall be recommended by the Fi-

nance Committee and approved by the Council of Representatives. The Executive Secretary may appoint such office personnel and acquire for the Association such office materials and equipment as the budget specifications warrant, except that appointments to his staff shall be approved by the Board of Directors.

7. The Executive Secretary shall report annually on the operations of the Central Office to the Council of Representatives through the Board of Directors. A summary of this report shall be presented to the Association, at the session of the annual convention devoted to Report of the Council, and published in the official journal of the Association.

ARTICLE XIV

Publications

1. Such records, reports, proceedings and journals containing scientific papers shall be published as are authorized by these By-Laws or by vote of the Council of Representatives or Board of Directors at any duly constituted meeting.

2. There shall be an official journal of the Association which shall contain programs, reports, proceedings, announcements, presidential addresses, and such other matters as the Council of Representatives or Board of Directors may deem appropriate.

3. The Association shall publish as journals of the Association those authorized by the Council of Representatives, including the official journal and *Psychological Abstracts*, both of which shall be distributed to all members. The Council has the authority to acquire journals by purchase or deed of gift, and shall honor previous agreements contained in contracts or deeds of gift.

4. Divisions of the Association may own and manage their own publications. With the approval of the Board of Directors and following recommendations of the Advisory Board of Publications, Divisions may assign the business management of such journals to the Central Office, without relinquishing editorial control. A Division may require its members to subscribe to its own special journal or journals.

5. Editors of Association journals shall be elected for a term of five years, one or two editors retiring at the end of each calendar year. (The present editors of Association journals shall continue for their terms.) Editors may be re-elected for one term only. Election shall be by the Council of Representatives upon receipt from the Advisory Board on Publications of at least two nominations for each vacancy. Editors shall normally be elected one year prior to their taking office as editor. In the case of the disability or resignation of any editor, the Board of Editors through its chairman shall be responsible for the editorial conduct of the journal concerned, until through the procedure described above, a successor has been duly elected to fill the unexpired term. By two-thirds vote of those present at an annual business meeting, the Council of Representatives may terminate an editor's term before its normal expiration.

6. The Board of Editors shall consist of the editors of the journals of the Association and the editors of Divisional journals. It shall be the duty

of the Board of Editors to outline general editorial policy, and to supervise the editorial conduct of the journals and to perform such other duties as are incident to its position or may properly be required by vote of the Council of Representatives or the Board of Directors. Any question involving reorganization of the journals or fundamental changes of policy shall be referred to the Advisory Board on Publications. The Board shall select its chairman annually. The Board shall have power to draw up rules and regulations for the conduct of its own meetings, for the guidance of editors, for the selection of assistant and associate editors, and for the submission of manuscripts. It shall be the duty of each editor to conduct his journal in conformity with the general policies outlined by the Board of Editors. The decision of an individual editor as to the selection or rejection of manuscripts submitted to him shall be final. Each editor shall submit once a year to the Board of Editors a written report concerning the state of the journal which he edits; and the Board, through its chairman, shall report annually to the Council of Representatives.

7. The Advisory Board on Publications shall consist of three members who are editors of Association journals elected by the Board of Editors from their own number and three members elected by the Council of Representatives from their own members who are not at the time editors of Association journals. Members shall serve for terms of three years, staggered so that one editor and one member of the Council is elected each year. (In order to place into effect, at the time of the first election the Board of Editors shall elect one member for a term of one year, one for two years, one for three years; similarly, the Council shall elect one member for one year, one for two years, one for three years.) Membership of the Council Representatives on the Advisory Board of Publications may outlast membership on the Council of Representatives. It shall be the function of the Advisory Board on Publications to make recommendations to the Board of Directors on the management of journals, on the acquisition, initiation, or discontinuance of journals, and on the nomination of editors. The President and President-Elect shall be *ex officio* members of the Board during their terms of office.

8. The Advisory Board on Publications shall elect annually a Chairman who shall preside at the Meetings of the Board, and shall conduct the official correspondence of the Board. The Chairman may be reelected.

9. The Advisory Board on Publications shall meet at least once each year just prior to the annual business meeting of the Council. At this meeting reports from the Chairman, the Editors, and the Executive Secretary shall be presented, and a final report for the Council of Representatives, together with appropriate nominations, shall be prepared. At any of its meetings the Board may, at its discretion, invite representatives of any of the publications of the Association or of the Divisions of the Association to be present to consider common problems.

10. The business management of the publications shall rest within the Central Office. It shall be the duty of the Executive Secretary as business manager to administer the business details of the journals in accordance with the policies outlined by the Board of Directors in consultation with

the Advisory Board on Publications. In his capacity as business manager, he shall submit an annual budget and shall make an annual financial report and such other reports as are required by the Board of Directors or the Council of Representatives. He shall secure competitive bids for the printing of the journals, shall maintain accurate mailing lists of subscribers and shall be responsible for the storage and subsequent sale of back numbers.

ARTICLE XV

Annual Convention

1. There shall be an annual convention of the Association at a time and place to be determined by the Council of Representatives. (The time and place of the first annual meeting shall be determined by enabling action of the national societies concerned therewith.) Announcement of time and place of the annual convention shall be made by the Council of Representatives one year and plans shall be made at least two years in advance thereof.

2. All Divisions of the Association and affiliated societies may arrange programs at the annual convention.

3. The Central Office shall provide such counsel and material assistance to the Division Program Committees and to the Convention Program Committee as may be requested and as seems to the Executive Secretary and the Board of Directors to be most effectively and economically provided by that office without prejudice to the best interests of the Divisions and the Association.

4. In lieu of an annual business meeting of members, the Convention Program Committee shall provide for a session at the annual convention on Report of the Council with the President of the Association presiding, such session not to conflict with other major program interests. At this session, the Council of Representatives shall submit a summary report of its business for the year, including summary reports from the Treasurer, the Board of Directors, and the Executive Secretary.

ARTICLE XVI

Subscriptions

1. The annual subscription to be paid by Fellows, Associates, Student Affiliates, and Division Affiliates shall be determined by the Council of Representatives. (The annual subscription for the first year*: for Charter Fellows shall be Fifteen Dollars per year; for Charter Associates, Ten Dollars per year; for Student Affiliates Five Dollars per year; and for Division Affiliates, Two Dollars per year.)

2. Subscriptions of Fellows, Associates, and Student Affiliates shall entitle them to the official journal of the Association, to *Psychological Abstracts* and to the Yearbook.

3. The annual subscription of Division Affiliates (non-members of the Association) shall be set by the Council of Representatives, over and

* It is estimated that $40,000 per year will be needed to provide the services of the new Association.

above such fees as the Division may require. For this subscription, Division Affiliates shall receive the official journal and the Yearbook.

4. There shall be made available to each Division to which an Associate or Fellow belongs, One Dollar from his subscription for the specific use of that Division. For the use of the first Division to which the member belongs, this sum shall be made available from the general subscription; for each additional Division, One Dollar shall be collected from the member in addition to the general subscription, and made available to this Division for its use. A Division may require additional subscriptions of its own members.

5. The Central Office shall act as the collection agency for the Divisions. All unexpended funds at the end of the fiscal year allocated to Divisions from Association subscriptions shall revert to the treasury of the Association. This shall not apply to any special subscriptions made in the name of the Division, and specified as non-reverting.

ARTICLE XVII

Amendments

[1. The Association, by mail vote of the members on the official rolls of the Association at the time of mailing, may adopt such By-Laws or amendments to By-Laws as it deems necessary for the management of the affairs of the Association, the prescription of the duties of officers, committees and employees, and for the conduct of all kinds of business within the objects and purposes of the Association. Amendments may be proposed by the Council of Representatives on its own initiative; or as the result of recommendations from the Policy and Planning Board; or from the Board of Directors, when approved by the Council of Representatives by a majority vote; or on petition signed by 200 members of the Association. A copy of each amendment proposed, with space appropriate for voting and such explanations of the amendment as the Council of Representatives deems necessary, shall be mailed to the last recorded address of each member. Sixty days after date of mailing, the ballot shall be closed and the votes counted by the Election Committee, which shall certify the result to the Council of Representatives at its next annual meeting, at which time the amendment, if passed by two-thirds of all the members voting, shall go into effect.

[ARTICLE XVIII]

[Enabling Action]

[1. These By-Laws shall be in force when they have been adopted, either as they stand or as amended, by both the American Association for Applied Psychology and the American Psychological Association. (While the other societies participating in the Intersociety Constitutional Convention are asked to express their adherence to the By-Laws, this article permits the reorganization to become effective when the two major societies have taken favorable action.)]

RECOMMENDATIONS OF THE INTERSOCIETY CONSTITUTIONAL CONVENTION OF PSYCHOLOGISTS

IV. Sample Blank for Survey of Opinion on the Proposed By-Laws*

1. *Divisional Organization.* Following is a list of possible divisions for a reorganized American Psychological Association. It is submitted for your vote in order that the results may assist the Joint Committee in setting up the initial divisional structure. An expression of opinion in this Survey does not commit you in any way on your later vote on the acceptance or rejection of the By-Laws. Indicate by a *single check* all the divisions you might wish to join if such divisions were established, and by a *double check* the division of your primary choice. Write the names of possible additional divisions in the blank spaces, and check in the same way.

( ) 1. Division of Abnormal Psychology
( ) 2. Division of Animal (comparative) Psychology
( ) 3. Division of Business Psychology
( ) 4. Division of Child (Developmental) Psychology (incl. adolescence)
( ) 5. Division of Clinical Psychology
( ) 6. Division of Consulting Psychology
( ) 7. Division of Educational Psychology
( ) 8. †Division of General Psychology
( ) 9. Division of Industrial Psychology
( ) 10. Division of Measurements and Statistics
( ) 11. Division of Military Psychology
( ) 12. Division of Personnel Psychology
( ) 13. Division of Physiological Psychology
( ) 14. Division of Public Service
( ) 15. Division of Social Psychology
( ) 16. Division on the Teaching of Psychology
( ) 17. Division of Theoretical, Systematic and Historical Psychology
( ) 18. Society for the Psychological Study of Social Issues (if a Division of the APA)
( ) 19. Psychometric Society (if a Division of the APA)

( ) 20. _____

( ) 21. _____

( ) 22. _____

* This is a sample copy of the blank to be circulated by mail later.

† Article III, Sec. 3, "Members of the Association not expressing a preference for any special division, shall be members of a Division of General Psychology."

2. *Society Membership.* Please check the societies to which you belong:

American Psychological Association
( ) Member
( ) Associate

American Association for Applied Psychology
( ) Fellow
( ) Associate
Section membership as follows:
( ) Clinical Section
( ) Consulting Section
( ) Educational Section
( ) Business and Industrial Section

( ) Psychometric Society
( ) Society for the Psychological Study of Social Issues
( ) Section I, American Association for the Advancement of Science

( ) National Institute of Psychology
( ) Society of Experimental Psychologists
( ) National Council of Women Psychologists
( ) Department of Psychology, American Teachers' Association

3. *Comments, Criticisms and Suggestions on the Proposed By-Laws.* In the following space (using additional sheets if necessary) enter your comments, criticisms or suggestions for the guidance of the Joint Constitutional Committee in revising the proposed By-Laws.

*Signature_____

* This reply will be considered by the committee whether or not it is signed.

PROCEEDINGS OF THE FIFTY-FIRST ANNUAL MEETING OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION, INC., EVANSTON, ILLINOIS SEPTEMBER 2, 1943

REPORT OF THE SECRETARY, WILLARD C. OLSON, UNIVERSITY OF MICHIGAN

Plans for a program of scientific sessions for the Annual Meeting were abandoned early (See *Psychological Bulletin*, May, 1943 p. 354) in accordance with a request from the Office of Defense Transportation.

On June 7, 1943, The Council of Directors exercised its interim emergency powers to change the place of meeting by the adoption of the following resolution:

WHEREAS a general shortage exists with respect to provisions for food, housing, and services and WHEREAS Members of the American Psychological Association have given the Council of Directors emergency powers, BE IT RESOLVED: (1) that the Council declare the existence of an emergency, and (2) that the Executive Committee be empowered to arrange for the Annual Meeting on September 2, 1943 at Evanston, Illinois, or at such other point with available accommodations in the Chicago area as the Committee shall choose.

Since transportation problems continued to increase rather than to decrease, plans for a skeleton meeting were subsequently revised to hold a token meeting for the transaction of essential business.

The following notice of meeting was sent to the last recorded address of all Associates and Members:

Ann Arbor, Michigan
August 12, 1943

TO ASSOCIATES AND MEMBERS:

You will recall that the 1942 Annual Meeting scheduled for Boston and Cambridge was cancelled in response to a request from the Office of Defense Transportation and a skeleton meeting in New York City was held instead. At that meeting the Association voted to hold another skeleton meeting on September 2, 1943 at Chicago unless restrictions on travel should be raised. Since restrictions on travel were still in force the Program Committee and Council early in the spring voted to cancel the call for papers and to confine the meeting to essential business. The intent was to hold a skeleton meeting to be attended by Officers, Members of Council, Chairman of Committees, Representatives, and such Members as were resident in the Chicago area. At that time skeleton meetings seemed to be

in accord with the policies and requests of the Office of Defense Transportation. Under date of July 15, 1943, however, new and urgent communications were received pointing out the serious crisis confronting the nation in the field of transportation and urging the cancellation or reconsideration of all plans for conventions.

This letter has caused the Executive Committee, the Program Committee, and Council to make still further alterations in the plans. It has been voted that Council members only be encouraged to travel any distance to the Annual Meeting in order to conduct the affairs of the Association. Those in the immediate vicinity are invited to attend a "token" Annual Meeting on the afternoon of Thursday, September 2. It is expected that most problems can be presented to Council by mail and that business requiring action can be handled by the emergency powers granted to Council at the last Annual Meeting if a quorum is not available. Other matters may need to be referred by mail to the broader base of Associates and Members.

In view of the great difficulty in securing adequate accommodations and services within the city of Chicago, the Council, by exercise of its emergency powers, has authorized the Executive Committee to arrange the meeting near Chicago rather than in Chicago itself. Through the courtesy of the officials of Northwestern University facilities for the meeting have been provided on the campus in Evanston, Illinois. Anyone finding it necessary to spend a night in Evanston should make their own arrangements with either the Orrington, Georgian, or North Shore Hotels.

A headquarters will be maintained at Scott Hall, beginning Tuesday, August 31 and extending through Thursday, September 2. Council will be in session beginning August 31 in the Hardy Lounge in Scott Hall. The "token" Annual Meeting is scheduled for Thursday, September 2, beginning at 1:30 P.M. in the auditorium of Lutkin Hall. It is expected that this meeting will be local and unrepresentative and that only those in the immediate vicinity whose presence will not tax the transportation system will attend. Such a meeting will provide an opportunity for a broader base for the discussion of policies. The objects of the Annual Meeting are: (1) To transact all items of business which may properly come before an Annual Meeting, (2) To elect Associates and Members, (3) To receive and act upon reports of committees and representatives, (4) To consider proposals from the Intersociety Constitutional Convention, (5) To make appropriations for the continuation of the Office of Psychological Personnel and other services of the Association, (6) To approve the annual budget, (7) To announce the results of the mail ballot on the election of officers and to elect a Secretary.

If you have items which should be placed on the agenda for consideration, please communicate with the Secretary.

Respectfully submitted,
EXECUTIVE COMMITTEE
JOHN E. ANDERSON, *President*
WILLARD L. VALENTINE, *Treasurer*
WILLLARD C. OLSON, *Secretary*

The Council of Directors of the American Psychological Association met on August 31 and September 1, preceding the Annual Business Meeting. The Board of Governors of the American Association for Applied Psychology also met prior to the Annual Business Meeting of that Society which was held on the afternoon of September 1. Professor A. T. Poffenberger of Columbia University was elected President of the American Association for Applied Psychology.

A joint meeting of the Council of the APA and of the Board of Governors of the AAAP was held on the evening of August 31 to discuss the recommendations of the Intersociety Constitutional Convention. A sub-committee consisting of Alice I. Bryan, Sidney L. Pressey, and C. M. Louttit was appointed from the AAAP and a sub-committee consisting of Ernest R. Hilgard, John E. Anderson, and Willard L. Valentine, was appointed from the APA to work jointly on the presentation of recommendations on organization to all psychologists. The joint committee is working under the general chairmanship of E. R. Hilgard.

The total of 70 persons who registered included 38 Members, 26 Associates, 1 newly transferred Member, 1 newly elected Associate, and 4 non-members.

Attendance of other than essential persons from a distance was discouraged and an analysis of the registration by states indicates that the recommendations were successful: Connecticut, 1; Washington, D. C., 2; Illinois, 34; Indiana, 1; Iowa, 4; Kansas, 1; Maryland, 1; Massachusetts, 2; Michigan, 3; Minnesota, 1; Mississippi, 1; New Jersey, 1; New York, 6; Ohio, 6; Pennsylvania, 2; Virginia, 1, Washington, 1; Wisconsin, 2.

Transactions of the Annual Business Meeting

The Annual Business Meeting of the American Psychological Association, Incorporated, was held on September 2, 1943, in the auditorium of Lutkin Hall, on the campus of Northwestern University at Evanston, Illinois. The meeting was called to order at 1:30 P.M. by the President, John E. Anderson.

Upon motion by the Secretary, seconded from the floor, it was voted that the minutes of the Fiftieth Annual Meeting, held at New York City, be approved as printed in the November, 1942, issue of the *Psychological Bulletin*.

Those in attendance stood in silent tribute as the Secretary read the names of the following Members and Associates who had

died since the last annual meeting: *Members:* Barbara S. Burks, May 25, 1943; Carl C. Brigham, January 24, 1943; C. C. Bunch, June 6, 1942; Edmund S. Conklin, October 6, 1942; Lillian J. Martin, March 26, 1943; James B. Miner, March 24, 1943; Rudolf Pintner, November 7, 1942; Edwin B. Twitmyer, March 3, 1943. *Associates:* Annette G. Bennett, December 16, 1942; Harold B. Bergen, November 4, 1942; C. D. Donaldson, November 25, 1942; Elizabeth Evans Lord, January 10, 1943; Roderick Menzies, February 22, 1943, Hans J. Peterson, May 22, 1942; Christian H. Stoelting, March 18, 1943.

The Secretary announced the resignation of the following five Members: Paul L. Boynton, Bryng Bryngelson, Jon Eisenson, Georgina S. Gates, and Irving C. Whittemore.

The Secretary announced the resignation of the following 73 Associates:

Altman, Sylvia
Bale, Elinor B.
Beck, Lloyd H.
Benjamin, Harold
Biddle, Anna E.
Bly, J. M.
Bornemeier, Russell W.
Bowman, Rufus D.
Brainard, Paul P.
Caldwell, Helen H.
Callahan, Jean M.
Campbell, Elise H.
Campbell, Malcolm
Cannon, Walter B.
Carey, Thomas F.
Chant, S. N. F.
Cooper, John H.
Culin, Eleanor D.
Curry, E. Thayer
Delf, Phyllis
Drury, Marjorie B.
Duncan, Bertha
Eads, Laura K.
Ellsworth, Ralph E.
Geier, Frederick M.
Goodlett, Carlton B.
Hanchett, Gertrude A.
Holway, Alfred H.
Hills, Myra E.
Hooker, Davenport
Hunsley, Yuba L.
Irwin, Charles C.
Kleemeier, Lyla B.
Koepp-Baker, Herbert
Langford, Ray C.
Lawrence, Merle
Lilliedale, Juanita
Lufkin, Harold M.
MacLean, Charles F.
Marshall, Wallace
Martinson, Betty M.
Mathewson, Robert H.
Mendenhall, James E.
McCarthy, Eugene F.
Morton, James T., Jr.
Morey, Robert
Murphy, Ross F.
Nield, James W.
O'Malley, Kathleen E.
Papurt, Maxwell J.
Potter, Margaret L.
Powell, Norman
Purdy, Donald M.
Ray, Joseph J.
Redfield, Janet E.
Rowell, Dorothy C.
Savides, A. P.
Schramm, Gregory J.
Scott, Adelin
Sherwood, William C.
Sigal, Sylvia F.
Sjaardema, H.

Sunley, John H.
Swift, William H.
Voss, Mildred D.
Waterman, Frederick
Westbrook, Charles H.
Wherry, Robert J.
Whisler, Ralph G.
Willey, Roy Deverl
Yepsen, Lloyd N.
Xoomsai, Tooi
Zorn, Blanche

The Secretary announced that J. Carleton Bell, Robert H. Gault, Max F. Meyer, and Helen T. Wooley had applied for and received the status of Life Membership.

The Secretary announced that the Council of Directors had approved the action of President Anderson in making the following appointments:

Norman C. Meier of the State University of Iowa as delegate to the inauguration of Charles A. Anderson as President of Coe College on November 12, 1942.

Frederick H. Lund of Temple University and Robert A. Brotemarkle as delegates to the Forty-Seventh Annual Meeting of the American Academy of Political and Social Science in Philadelphia, April 9 and 10, 1943.

John P. Nafe of Washington University to act as Representative at a meeting for the reestablishment of the Department of Higher Education as one of the major departments of the National Education Association at St. Louis, Missouri on February 25, 1942.

The Secretary announced the following interim actions of Council and other activities of interest to the Association:

The seventh joint meeting of the Council of Directors and Board of Editors was held on Wednesday, September 1, 1943 at which time reports on editorial and business policies were discussed.

The *Journal of Applied Psychology* was purchased December 16, 1942 from James P. Porter, owner and publisher.

Donald G. Paterson was elected as Editor of the *Journal of Applied Psychology* by the Electoral Board from a panel supplied by the American Association for Applied Psychology for a six year term beginning January 1, 1943.

John F. Dashiell was reelected as Editor of *Psychological Monographs* by the Electoral Board for a six year term beginning January 1, 1943.

Gordon W. Allport was reelected as Editor of the *Journal of Abnormal and Social Psychology* by the Electoral Board for a six year term beginning January 1, 1944.

Council on November 20, 1942 voted an appropriation of $350.00 to cover railroad fare and pullman for attendance of the Board of Editors and Business Manager of Publications at a meeting at a time other than that of the Annual Meeting.

The Election Committee, under date of March 16, announced the election of the following delegates and alternates to the Intersociety Constitutional Convention in the manner prescribed at the 1942 meeting:

Delegates: John E. Anderson, Leonard Carmichael, John F. Dashiell, Calvin P. Stone, Robert M. Yerkes, *Alternates:* Steuart H. Britt, E. R. Hilgard, Clark L. Hull, Willard C. Olson, Herbert Woodrow. Clark Hull as first alternate served for John F. Dashiell who was unable to attend.

On April 10, 1943, Council voted an appropriation of $500.00 toward the traveling expenses of delegates to the Intersociety Constitutional Convention.

The Intersociety Constitutional Convention of Psychologists was held in New York City on May 29 and 31, for the purpose of considering the amalgamation or cooperation of existing psychological societies in the furtherance of their scientific and professional aims.

President John E. Anderson, as instructed by the Association at the 1942 meeting, appointed the following Members to the Committee on College Curriculum Adjustments in Psychology to cooperate with the U. S. Office of Education Wartime Commission: H. E. Garrett, Chairman, Horace B. English, Edna Heidbreder, Ernest Hilgard, B. V. Moore, Louise Omwake, and Dael Wolfle. Council subsequently voted an appropriation of $300.00 to permit a physical meeting of the Committee.

The Secretary spent April 12, 1943 in Detroit as an observer at the Clearing House operated by the American Chemical Society on the occasion of the Annual Meeting. Alden H. Emery, Assistant Secretary, described and interpreted the procedures used in bringing employers and employees into contact.

By vote of Council the Secretary circulated materials to all Associates of five or more years standing calling attention to the requirements of transfer. With the approval of Council, the Secretary also sent materials on Associateship to all non-affiliated registrants with the OPP and to non-affiliated members of affiliated societies. The Secretary received the generous cooperation of the Director of the OPP and the secretaries of affiliated societies. No doubt these activities assisted in sustaining the high rate of transfer and associate applications during a war year.

With the cooperation of Samuel W. Fernberger, the Secretary has supplied the AAAS with a brief history of the Association for printing in the AAAS Bulletin.

On January 9, 1943, Council elected John E. Anderson as the Association's representative to the Emergency Committee in Psychology to succeed Walter Miles.

Council has been informed that Donald G. Marquis of Yale University has been selected by the Emergency Committee in Psychology to succeed Steuart H. Britt as Director of the Office of Psychological Personnel. Dr. Britt left the post to become a lieutenant in the Naval Reserve.

Willard C. Olson was elected by Council as Representative of the APA to the Council of the AAAS to succeed Edmund S. Conklin, deceased.

Leonard Carmichael reports the dissolution of the National Committee on Education and Defense to which he had been named as representative of the APA.

Dael Wolfle in the absence of Calvin Stone, Chairman of the Election Committee, announced the election of the following officers and representatives by mail ballot:

President for 1943–1944: Gardner Murphy, College of the City of New York

Council of Directors for 1943–1946: Donald G. Marquis, Yale University and C. M. Louttit, Bureau of Naval Personnel, Washington, D. C.

Nominees for Representatives to the Division of Anthropology and Psychology of the National Research Council: Edna Heidbreder, Wellesley College; Ernest R. Hilgard, Office of War Information and Willard C. Olson, University of Michigan

Representative on the Social Science Research Council: Harold E. Jones, University of California at Berkeley

The President next took up in order the items on the mimeographed list of recommendations of the Council of Directors. These were presented as motions already made and seconded and open for discussion. Some presentations were made by Members who were present. In other instances, the Secretary presented the reports that had been received.

The Association voted to elect the following three persons directly as Members: Gladys L. Anderson, Emmet A. Betts and Harry D. Bouman.

The Association voted to transfer the 102 Associates named below to status of Members:

Adams, Clifford
Adams, Sidney
Ames, Louise B.
Ansbacher, Heinz L.
Arsenian, Seth
Babcock, Harriet
Bagchi, Basu K.
Baller, Warren
Bartlett, Marion R.
Bell, Hugh M.
Bender, Irving E.
Blankenship, Albert
Bobbit, Joseph M.
Bolles, Mary M.
Bolton, Euri B.
Bryan, Alice I.
Bugelski, B. Richard
Burchard, Edward M.
Burnside, Lenoir H.
Carlson, Hilding B.
Child, Irving L.
Clark, Edward L.
Cook, Stuart W.
Crider, Blake
Croft, Lysle W.
Curtis, Quin F.
Eisenberg, Philip
Fay, Paul J.
Finger, Frank W.
Finley, Cecile B.
Fisher, M. Bruce
Fjeld, Harriet A.
Gentry, Evelyn
Goldstein, Kurt
Greene, Katharine B.
Habbe, Stephen
Hanks, Lucien
Harris, Albert J.

Henry, Franklin M.
Hilden, Arnold H.
Hinckly, Elmer D.
Humes, John F.
Jackson, Theodore A.
Jensen, Milton B.
Katz, Barney
Kelley, Noble H.
Kirk, Samuel A.
Klopfer, Bruno
Langhorne, Maurice C.
Layman, James W.
Lehman, Harvey C.
Lester, Olive P.
Lewinski, Robert J.
Longstaff, Howard P.
Macfarlane, Jean
Mathews, Chester O.
McCarthy, Dorothea A.
Maxfield, Kathryn E.
Morgan, Clifford T.
Mull, Helen K.
Newman, Sidney H.
Nowlis, Vincent
Omwake, Katharine T.
Patrick, Catharine
Phillips, Wendell S.
Ray, Wilbert S.
Riggs, Lorrin A.
Roberts, Katherine E.
Robinson, Francis P.
Rosen, Esther K.
Ross, Clay C.
Russell, Roger W.
Sarbin, Theodore
Sargent, S. Stansfeld
Seitz, Clifford P.
Selling, Lowell S.
Sells, Saul B.
Shaffer, Laurance F.
Sharp, Agnes A.
Sharp, Winford L.
Shartle, Carroll L.
Shuey, Audrey M.
Shultz, Irvin T.
Smith, G. Milton
Smoke, Kenneth L.
Solomon, Richard S.
Steckle, Lynde C.
Stone, Lawrence J.
Stromberg, Eleroy L.
Stuit, Dewey B.
Super, Donald E.
Swanson, Donald E.
Taylor, E. Katzoff
Terry, Paul W.
Vetter, George B.
Wait, Wallace T.
Walker, Robert Y.
Watson, Robert I.
Wittman, Mary P.
Wright, Herbert F.
Wylie, Margaret
Yacorzynski, George K.

The Association voted to elect as Associates the 419 persons whose names appear below:

Abrams, Meyer Howard
Ackerman, Bernard R.
Adams, John Davry
Ahner, Charles W.
Anderson, George Lester
Aronson, Manuel
Ax, Albert Francis
Ayers, Arthur W.
Babb, W. W. Martin
Baden, Samuel Elliott
Bailey, Phyllis Elaine
Bair, John T.
Baird, Helen Lucile
Bakanofsky, David
Ball, Robert Jaudon
Barahal, George Dean
Batcheller, Delmer E.
Bates, Jerome Elliott
Bavelas, Alex
Becker, Roland F.
Bell, Grace
Bender, Dorothy
Benson, Lauren Albert
Berger, Evelyn M.
Bernstein, Lewis
Betke, Sister Mary Angela
Bettelheim, Bruno
Bier, William C.

Birbeck, Barbara J.
Bixler, Ray Herbert
Blake, Robert Rogers
Blatt, Benjamin
Bleakley, W. Harold
Blocksma, Douglas D.
Blodgett, Emerson F.
Blommers, Paul
Blum, Rosalind F.
Boehm, Alice Evelyn
Bondy, Curt Werner
Bowles, J. W., Jr.
Breland, Marian K.
Breslaw, Bernard J.
Brody, Benjamin
Broom, Perry Morris
Brownfield, Edith D.
Bryan, Robert C.
Burgemeister, Bessie B.
Burnett, Collins W.
Burns, Henderson G.
Cabral, Annita de Castilho
Calabresi, Renata
Chen, Han Piao
Chesky, Florence M.
Clapp, Hazel Scofield
Clark, Ruth E.
Clark, Violet E.
Coe, Samuel
Cohen, Josef Bertram
Cohen, Leonard M.
Colm, Hanna
Combs, Arthur W., Jr.
Cooperman, Irene G.
Craig, J. Harry
Cronbach, Lee Joseph
Crose, Jean Margaret
Crumbaugh, James C.
Crutchfield, McNairy M.
Dailey, John Thomas
Dalton, Robert H.
Dameron, Lawrence E.
Davidson, William M.
Davis, Frank Parker
Davis, Jeanne C.
Davis, Romayne E.
Day, Daniel D.
Deakins, Clarence E.
Decker, Harvey L.
Deemer, Walter L., Jr.
DeHaney, Kenneth G.
De Noover, Lambert
Delman, Louis
Demarest, Ruth
DeMott, John J.
Denny, Maurice R.
Deren, Amalie Muriel
Derner, Gordon F.
Derrer, Helen M.
DesLauriers, Augustin
Devine, Alfred N.
Diggory, James Clark
Dillinger, Claude M.
DiMichael, Salvatore G.
Dodson, Willie Anna
Doerr, Dorothy A.
Donofrio, Anthony F.
Doppelt, Jerome E.
Dragositz, Anna
Drucker, Bertram M.
Eckert, Ralph G.
Edmonston, Kay
Eliach, Ezekiel
Eliasberg, Wladimir
Elkisch, Paula
Ellis, Albert
Emery, Clifton W.
Escalona, Sibylle K.
Evans, Chester E.
Everest, Lloyd G.
Eysenck, Hans Jurgen
Farwell, Jane E.
Felsinger, John M.
Fink, Harold K.
Flory, Charles D.
Flowerman, Samuel H.
Folsom, Angela T.
Forer, Bertram Robin
Franklin, John F.
Fredenburgh, F. Alvah
Freeburne, Cecil M.
Freeman, Albert V.
French, Vera V.
Friedmann, Alice
Gair, Mollie
Galway, Edward H.
Garber, Robert B.
Garner, Wendell R.

Gebhard, Mildred E.
Geisel, John B.
Genn, George
Gerberich, Joseph R.
Gersoni, Charles
Giles, William W., Jr.
Gillman, Robert D.
Glaser, Robert
Glixman, Alfred F.
Gondree, Howard E.
Goodwin, Ida Jean
Gordon, Edna Isabel
Gragg, Donald B.
Graham, Virginia
Greenberg, Viera H.
Greenberger, Lawrence F.
Grimm, Elaine R.
Grings, William W.
Griswold, Janet H.
Guiles, Austin P.
Hamilton, R. Jane
Hampton, Peter
Handley, Isabel H.
Handrick, Fannie A.
Harbaugh, Barbara E.
Harper, Virginia M.
Harlow, Justin E.
Harris, Frank J.
Harris, William E.
Hartman, William J.
Hauser, S. Frederick
Harvey, Lucy Jean
Hausman, Howard J.
Hawkins, Harry Leslie
Hefferline, Ralph F.
Henke, Milo Walter
Herman, David T.
Herland, Leo
Hess, Lawrence W.
Hill, Arthur S.
Hillhouse, James Newton
Hobson, Robert Louis
Hock, Anthony E.
Hodges, Carroll B.
Holland, Glen Allen
Holmes, William F.
Hood, Jean A.
Hoopingarner, Newman
Horowitz, Milton W.
Horton, Lydiard H.
Howard, Daniel D.
Hsü, En Hsi
Huey, Edith H.
Humber, Wilbur J.
Jacobson, David
James, Alice Marie
Janes, William H.
Jenkins, David H.
Johannaber, Elizabeth C.
Johnson, Olof
Johnson, Paul E.
Johnson, Thomas F.
Johnson, Walter F., Jr.
Jolles, Isaac
Kantor, Robert Edwin
Keller, Robert J.
Kelly, Thomas J.
Kendler, Tracy S.
Kilby, Richard W.
Killian, Frank, Jr.
King, Joseph E., Jr.
King, Wilbur R.
Kinzer, John Ross
Knight, Edward R.
Korchin, Sheldon J.
Korda, Geraldine J.
Kramer, George A.
Kraus, Philip E.
Kushner, Rose E.
LaGrone, Cyrus W., Jr.
Lambert, William W.
Lane, Robert C.
Lashof, Flora A.
Lassman, Frank M.
Lawrence, Douglas H.
LeCraft, Beatrice A.
Lehmann, Josephine
LeShan, Lawrence L.
Letts, Elizabeth
Levin, Stanley
Levine, Milton
Levine, Abraham S.
Li, Gwen-Yuen
Lichtenstein, Arthur
Linnick, Ida
Lipman, Jeanne L.
Lit, Alfred
Littleton, Martha E.

Lively, Mary Louise
Loken, Robert D.
Louise, Sister Mary
Lucio, William H.
Lundin, Robert W.
MacCorquodale, Kenneth
Macdonald, Gordon L.
Madeira, John Philip
Madsen, Iver Nelson
Malamud, Isadore
Malone, John Thomas
Manoil, Adolf
Maraffie, Lewis F.
Marker, Beatrice W.
Marshall, Frances P.
Martin, Howard Gray
Matte, Ignacio Blanco
Matulaitis, Peter
McCormick, Kennon F.
McDade, Sister Mary T.
McHose, Samuel B.
McIlvaine, Harold R.
McMahon, Ottis Kelly
McNeal, Benjamin F.
McQuitty, John V.
Meehl, Paul Everett
Meiss, Margaret L.
Meissner, James H.
Mellenbruch, Paul L.
Millen, Helen Jane
Miller, James Grier
Miller, Robert B.
Milstein, A. Freda
Miner, Robert J.
Mitchell, Marjorie
Moon, Sheila E.
Morgan, David W.
Morgan, Fred B.
Moriarty, Alice M.
Morris, Phyllis A.
Moter, Maida K.
Mueller, Ralph
Mueller, Ronald A.
Muench, George A.
Munson, Mary Elizabeth
Murphy, Helen A.
Mussen, Paul H.
Napoli, Peter J.
Neal, Leola E.
Needham, Michael
Nelson, James H.
Newman, Michael
Niehaus, Stanley W.
O'Brien, George L.
Oppenheimer, Franz M.
Otness, H. Robert
Owens, Henry Grady
Paff, Gertrude E.
Patterson, Cecile H.
Pearl, Penelope M.
Peckham, Ralf A.
Pepitone, Albert D.
Perlow, Esther
Philips, Charles L.
Philleo, Charlotte C.
Pollack, Ruth C.
Pompan, Janet J.
Popenoe, Edith P.
Porter, Robert B.
Proshansky, Harold M.
Quadfasel, Fred A.
Quinsey, Donald L.
Rashkis, Harold A.
Rebish, Della
Reynolds, William A.
Rich, Joseph M.
Richardson, Carroll H.
Richardson, LaVange H.
Ritholz, Sophie
Roberts, David H.
Roberts, Leo
Robinson, Harvey A.
Robitaille, Henry J.
Rogers, J. Maurice
Romero, Margaret R.
Rosenthal, Bernard G.
Rotter, Clara B.
Rouse, Richard O., Jr.
Roy, Howard L.
Rust, Ralph M.
Salman, Bella
Salomon, Ann Douglas
Samuelson, Babette F.
Schmidt, David G.
Schmierer, Hyman
Schoenfeld, Heinz
Schofield, William, Jr.
Schonbar, Rosalea

Schrickel, Harry G.
Seaton, Kirk
Seeman, Stanley H.
Sender, Sadie
Shapiro, Irving
Shapiro, Solomon
Shattyn, Grace B.
Sheldon, Charles A.
Sherman, Harry
Shimp, William B.
Siebrecht, Elmer B.
Silver, Harry B.
Smith, Alathena J.
Smith, Anthony J.
Smith, George H.
Smith, Henry P.
Sneed, William H.
Snelling, Janet I.
Snoke, Mary Esther
Soares, Margaret L.
Sobel, Lottie
Sonday, Francis L.
Soskin, William F.
Sowiski, Jeanne C.
Speevack, Morris
Sprow, Allen J.
Stack, Norman Arthur
Stark, Irma
Staudt, Virginia M.
Steinberg, David
Steinberg, Morris P.
Steinman, Alberta R.
Steinzor, Bernard
Stephenson, George R.
Sternberg, Elsie E.
Stevens, William C.
Stewart, Jay M.
Stoll, George J., Jr.
Strang, Arthur L.
Stromberg, Jean T.
Sutherland, Anna Jean
Sweet, Alex L.
Swimmer, Reuben L.
Taliaferro, Mary L.
Taubman, Robert E.
Todd, Margaret E.
Traxler, Arthur E.
Triggs, Frances O.
Tsai, Chao-Siu
Tschechtelin, Sister Mary A.
Tucke, Charles L.
Tucker, Donald K.
Turchioe, Rita Marie
Turnbull, William W.
Usher, Joan Hope
Van Alstyne, Pauline C.
Van Buskirk, Golda M.
Van Der Lugt, Maria J.
Veltfort, Helene R.
Wagner, Enid Ruth
Walker, John L.
Wallraff, Charles F.
Wasson, Marianne H.
Watson, Sarah Martha
Wattles, Robert S.
Webb, Sam Clement
Webb, Wilse B.
Weitz, Robert D.
Welch, James C.
West, William A.
Westberg, William C.
Weston, Julien V.
Wheeler, Douglas E.
Wheeler, Erma F.
Wheeler, William M.
White, Bruce
White, J. Gustav
Whittredge, Barbara F.
Wilkes, Sherrell R.
Wilkinson, Bryan L.
Williams, Mary F.
Willmann, John M.
Winiarz, Francis A.
Witkin, Arthur A.
Woltman, Adolf G.
Wood, Kenneth S.
Woodruff, Aschel D.
Woodruff, Joseph L.
Wurster, Clyde H.
Yedinack, Jeanette G.
Yellin, Herbert C.
Young, Marguerite L.
Zadek, Mildred A.
Zambrowski, Basia B.
Zimmerman, Fred
Zimmerman, Frederick
Zucker, Herbert J.

Upon recommendation of the Council of Directors the Association voted:

That the present Program Committee, consisting of Harold Burtt, Chairman, Dael Wolfle and the Secretary, be continued for 1944.

That W. N. Kellogg of Indiana University be made Chairman of the Committee on Precautions in Animal Experimentation and that Roger B. Loucks be made a member of the Committee for the term 1943–46.

That the report of the Committee on Motion Pictures and Sound Recording Devices in the Instruction of Psychology, C. R. Carpenter, Chairman, be accepted with thanks and ordered printed in the Proceedings, and that the Committee be continued with the addition of Lester F. Beck. The Association further voted that the name of the Committee be changed to the Committee on Audio-Visual Aids. (See Reports)

That the Committee on Psychology and the Public Service, L. J. O'Rourke, Chairman, be continued with its present membership.

That the progress report of the Committee on the Preparation of Examination Questions in Psychology, Edward B. Greene, Chairman, be accepted with thanks, and that the Committee be continued with the following members: Dorothy C. Adkins, Chairman, Charles Bird, Paul R. Farnsworth, William R. Wilson, and S. Edson Haven.

That the report of the Committee on Investments, Willard L. Valentine, Chairman, be accepted with thanks, ordered printed in the Proceedings, and that the Committee be continued with its present membership. (See Reports)

That the report of the Committee on Scientific and Professional Ethics, John F. Dashiell, Chairman, be acknowledged and the Committee commended for its handling of the problems referred to it for adjustment. The Association further voted to appoint L. L. Thurstone as Chairman, and to appoint Herbert Woodrow for the term 1943–47 to replace John F. Dashiell whose term expires. The Association further voted that the Committee be requested to attempt a tentative codification of principles operative in cases which have been studied.

That the report of the Committee on the Constitution, John F. Dashiell, Chairman, be accepted with thanks, and ordered printed in the Proceedings; and that the Committee be continued with the following membership: Ernest Hilgard, Chairman, John E. Anderson, and Willard L. Valentine. The Association voted that the constitutional change, recommended by the Committee, be laid on the table pending discussion of plans for new By-Laws. (See Reports)

That the Committee on Displaced Foreign Psychologists, the late Barbara S. Burks, Chairman, be discontinued with thanks for its effective services during a trying period for European Psychologists. As requested at the 1942 meeting the Committee has been turning over its functions as rapidly as practicable to the Office of Psychological Personnel.

That the Committee on Extension of Functions of the Secretary's Office, Herbert Woodrow, Chairman, be discontinued with an expression of appreciation for its past services.

That the terminal report of the Committee on Observance of the Fif-

tieth Anniversary of the American Psychological Association and the Centennial of William James, Edwin G. Boring, Chairman, be accepted and printed in the Proceedings, and that the Committee be discontinued with thanks for its important accomplishments. (See Reports)

That the report of the Committee on War Services to Children, created jointly with the AAAP under the Chairmanship of Arthur T. Jersild, be acknowledged with thanks and ordered printed in the Proceedings and that the Committee be empowered to name representatives to participate officially in any inter-disciplinary organization that is or may be established to co-ordinate war-time and post-war activities on behalf of children. (See Reports)

That the Committee on Publicity and Public Relations be continued with its present membership and with the addition of Floyd Ruch as Chairman.

That the Committee on Standardization of Measures on Electrical Skin Resistance, G. L. Freeman, Chairman, be continued.

That the Committee on Titles and Content of Courses in Psychology, Harold A. Edgerton, Chairman, be discontinued.

That the Committee on College Curriculum Adjustments, H. E. Garrett, Chairman, be thanked for its work in the preparation of the report printed in the *Psychological Bulletin*, **40**: 528–535, July, 1943, and that the Committee be discharged.

That the report of its representatives to the American Association for the Advancement of Science be accepted with thanks and ordered printed in the Proceedings, and that A. T. Poffenberger and Willard C. Olson be continued as representatives. (See Reports)

That the report of the Association's representative to the American Documentation Institute, be accepted with thanks and ordered printed in the Proceedings, and that Steuart H. Britt be continued as representative. (See Reports)

That the progress report of the representative of the American Psychological Association to the American Standards Association be accepted with thanks and that Harold O. Gulliksen be continued as representative.

That the report of the delegates to the Inter-Society Color Council be accepted with thanks and ordered printed in the Proceedings, and that affiliation with the Inter-Society Council be continued. The Association further voted to continue the present delegation with its Chairman, Forrest Lee Dimmick, and with the addition of S. Rains Wallace as a member. (See Reports)

That the report of the representative to the Division of Personnel of the National Committee for Mental Hygiene, be accepted with thanks, ordered printed in the Proceedings, and that Joseph Zubin, be continued as representative. (See Reports)

That the report of Leonard Carmichael, Chairman of the Division of Anthropology and Psychology, National Research Council, be accepted with thanks and ordered printed in the Proceedings. (See Reports)

That the report of A. T. Poffenberger, representative to the Social Science Research Council, be accepted with thanks and ordered printed in the Proceedings. (See Reports)

That Willard C. Olson, Secretary, be appointed to succeed John E. Anderson, retiring President, as representative of the Association to the Emergency Committee on Psychology of the National Research Council.

To appropriate $10,000 to the National Research Council for the support of the Office of Psychological Personnel for the calendar year 1944 to be expended by the Treasurer according to a budget approved by Council. It is understood that any unexpended balance as of December 31, 1944, shall revert to the Association.

That $2.00 be assessed on Members and Associates to assist in financing the War efforts of Psychologists through the Office of Psychological Personnel and that foreign Members and foreign Associates be exempted from the assessment.

To approve in principle the report of the Continuation Committee of the Intersociety Constitutional Convention and to take the following specific actions:

(a) That the Committee on the Constitution serve as a liaison committee with the AAAP in perfecting the proposed By-Laws and presenting them to the membership.
(b) That $600, or such part of it as is necessary, be appropriated for the expenses of the Committee on the Constitution.
(c) That the Committee on the Constitution be authorized to print the tentative By-Laws and a foreword in the *Psychological Bulletin* and to secure a provisional mail vote to revise the By-Laws.
(d) That a second mail vote of Members and Associates be taken on the revised By-Laws and that the results of this vote be counted by the Election Committee 30 days after the mailing of the ballot and be made available at the next Annual Meeting.

To create a Committee on the Graduate and Professional Training of Psychologists with Edwin R. Guthrie as Chairman and J. Elliott Janney, Donald G. Marquis, Bruce V. Moore, Sidney Pressey, Robert R. Sears, and Willard Valentine as members.

To acknowledge the application of the Society of Experimental Psychologists for affiliation as received from the Secretary, Samuel W. Fernberger, under date of April 14, 1943, and to place the application on the agenda for consideration at the 1944 meeting as prescribed by the Constitution.

That the report of the Treasurer and Business Manager of Publications, Willard L. Valentine, for the year ending December 31, 1942, be approved and ordered printed in the Proceedings. The report is supplemented by a report of the auditors. (See Reports)

That the Treasurer's budget for 1944 be approved and ordered printed in the Proceedings. (See Reports)

That Willard C. Olson be reelected Secretary of the Association for the term 1943–46.

That the Council be empowered to make arrangements for the 1944 meeting to be held some time during the week beginning September 3 at a place to be determined later.

Upon motion by Edwin R. Guthrie, duly seconded, the Association unanimously adopted the following resolution:

Be it resolved that the American Psychological Association, assembled at the Fifty-first Annual Meeting, expresses its thanks to the members of the Department of Psychology and the officials of Northwestern University for the use of rooms and dining facilities and for the services attendant on the Annual Meeting.

There being no further business, the meeting adjourned at 3:30 P.M.

REPORTS

Report of the Committee on Motion Pictures and Sound Recording Devices in Instruction of Psychology

To the Council of Directors and Members of the American Psychological Association:

The Committee has not met during the year. This is because of the fact that there was no annual meeting of the Association and because of the wide dispersal of the members of the Committee. Considerable correspondence has not substituted for meetings of the Committee which should meet two or three times annually in order to do the necessary work.

Attempts were made during the year to arrange for continuing the publication of the Cinema Register and for making available the films which have been described in this publication. In spite of the willingness of Professor Albert Ford to cooperate completely toward this end, it was impossible to make satisfactory arrangements for handling the films.

Contact has been maintained with agencies producing government films for instructional purposes. Thus far, only a very limited number of films have been produced which are suitable for use in instructional work in psychology. The quality of government films is improving and there is the possibility that during this coming year several films and film devices will be produced that will aid in the teaching of psychology.

The following problems exist and should be solved at the earliest possible time:

1. There is a lack of coordination in the production of films for use in psychological instruction.
2. The quality of films which have been produced and those that are being produced are in the main below the standards which are necessary in order to get and hold the attention of students in the classroom.
3. There is a need for a film reviewing and evaluating authority. Perhaps it is desirable that the Association give necessary power to the Committee for the evaluation and approval of films for the Association.
4. There is need for a film library both for the distribution of films for rentals and for the sale of prints.

5. There is need for greater circulation of information about sound recording and reproducing devices and their possible uses in instructional work. For example, the Sound Mirror has a wide potential use in the classroom.

6. There is need for research which demonstrates the degree to which films are effective in instruction of psychology and the relative effectiveness of various methods of presentation.

7. All films now available that relate to or can be used in instructional work in psychology should be reviewed and evaluated at the earliest possible date and improved or withdrawn from general circulation.

Recommendations: 1. That the name of this Committee be changed to read The Audio-Visual Aids Committee of the American Psychological Association.

2. That the Committee be given authority to review, evaluate and approve films for the American Psychological Association and that this Committee be designated as the official channel through which all films and sound recording or reproducing materials will be handled.

Respectfully submitted,
KENNETH H. BAKER
MILTON METFESSEL
WILLARD L. VALENTINE
C. R. CARPENTER, *Chairman*

REPORT OF THE INVESTMENT COMMITTEE AS OF DECEMBER 31, 1942

To the Council of Directors and Members of the American Psychological Association:

The invested surplus of the Association is in nine banks located throughout the country and in railroad bonds and U. S. Government obligations. During the year the total interest derived from these sources was $1,087.85.

Respectfully submitted.
LEONARD CARMICHAEL
SAMUEL W. FERNBERGER
WILLARD L. VALENTINE, *Chairman*

REPORT OF THE COMMITTEE ON THE CONSTITUTION

To the Council of Directors and Members of the American Psychological Association;

The members of the Committee have had before them during the year a few questions, upon only one of which are we ready to base a definite recommendation. They are:

I. Left over from last year is the suggestion made to us that in the listing of a member or an associate in the Yearbook he be allowed to use an "*A*" to indicate a field in which he is engaged in applied work—paralleling the uses of "*I*" and "*R*."

WE RECOMMEND *that Article X, Section 2, be altered by adding to sentence one, "and (5) their fields of applied work."*

II. We have considered suggestions for closer relations between the APA and the AAAP. On this we postpone any recommendation.

III. We have received the suggestion that the APA might well delete the requirement of a delay of one year before a petition for affiliation received from another society can be approved by the APA (Article XI Section 1). On this also we postpone recommendation.

Explanation: Postponements of matters under II and III—and I also perhaps—seems advisable in view of the fact that a Continuing Committee of the Intersociety Constitutional Convention which met in May, is now at work on major proposals for closer organization of many psychological societies, involving a reorganization of the APA.

IV. We recommend that some Committee on the Constitution be continued, but perhaps differing in size and in personnel from the present one.

Respectfully submitted,

LUTON ACKERSON
JOHN E. ANDERSON
SAMUEL W. FERNBERGER
ROBERT B. MACLEOD
KARL F. MUENZINGER
BRONSON PRICE
DAEL L. WOLFLE
ROBERT S. WOODWORTH
JOHN F. DASHIELL, *Chairman*

REPORT OF THE COMMITTEE ON OBSERVANCE OF THE FIFTIETH ANNIVERSARY OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION AND THE CENTENNIAL OF WILLIAM JAMES

To the Council of Directors and Members of the American Psychological Association:

On behalf of the Committee on Observance of the Fiftieth Anniversary of the American Psychological Association and the Centennial of William James, the Chairman begs to report that plans were made for two celebrations in Cambridge at the meetings of the American Psychological Association in September, 1942. The celebrations were cancelled when the meetings were cancelled, and the Committee secured papers from principal participants and short papers from those who were to have spoken extemporaneously and from a few others who would have been asked but who would probably not have been able to come. All of these papers, together with an exhibit of the growth of psychological journals in America from 1892–1942 and two exhibits of James' letters, as well as a Jubilee of the *Psychological Review* in its fiftieth volume, were published in the January number of the *Psychological Review* in 1943. That number and the preface to it constitute the already printed report of the Committee.

The Chairman recommends the discharge of the Committee.

Respectfully submitted,
EDWIN G. BORING, *Chairman*

REPORT OF THE COMMITTEE ON WAR SERVICES TO CHILDREN

To the Council of Directors and Members of the American Psychological Association:

The Committee has sought to participate in wartime efforts in behalf of children, and to take stock of research dealing with the impact of war on children.

The Committee has offered its services to various national and regional bodies, and it has offered to be of assistance in connection with foreign relief and rehabilitation service operations under the auspices of the Department of State. In order to be informed as to how best it might be of service, suggestions were solicited in a note in the *Psychological Bulletin* of April, 1943, and in letters sent to a number of psychologists located throughout the country.

Through one of its members, the Committee has prepared a critical review of literature dealing with the impact of the war on children, for publication in an early issue of the *Psychological Bulletin*.* Information as to studies that are under way or that are being planned has been solicited, and on a limited scale the Committee has served as a clearing house for current investigations in this field. It is contemplated that further comprehensive surveys be prepared during and following the war.

Continuation of the Association's interest in these lines of activity seems desirable. Since undertakings in child welfare involve many disciplines other than psychology, the Committee is of the opinion that provisions should be made, either through stipulations with regard to the present Committee or through a different arrangement, that would enable the Association officially to participate in the work of an inter-disciplinary organization or committee that is or might be established to coordinate wartime and postwar activities in behalf of children.

Respectfully submitted,
JOHN E. ANDERSON
GERTRUDE HILDRETH
KATHRYN E. MAXFIELD
CATHERINE C. MILES
R. T. ROCK, JR.
GLADYS C. SCHWESINGER
MARY M. SHIRLEY
FRANK K. SHUTTLEWORTH
ANNA S. STARR
ARTHUR T. JERSILD, *Chairman*

REPORT OF THE REPRESENTATIVES TO THE COUNCIL OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

To the Council of Directors and Members of the American Psychological Association:

The one hundred and eleventh annual meeting of the American Association for the advancement of Science which was to be held in New York City beginning December 28, was cancelled by its Executive Committee, at the direct request of the Office of Defense Transportation.

The address of the retiring President of the Association, Dr. Irving Langmuir, was published in the January 1 issue of *Science*. It should be read by all psychologists, as it argues for certain limitations upon the functions of Psychology and the Social Sciences generally. The newly

* *Psychol. Bull.*, 1943, **40**, 541–573.

elected President is Isaiah Bowman, President of Johns Hopkins University.

By vote of the Fellows of the Section of Psychology, Herbert Woodrow, Professor of Psychology at the University of Illinois, was elected Vice-President.

A most unusual program had been arranged jointly with the Section on Education. There was to be a symposium on the question: "What should the Ordinary Citizen Know about my Field?" Twelve past presidents of the AAAS were to participate. It seems most unfortunate that such an excellent plan had to be abandoned.

It is noted that the two distinguished representatives who signed the section report in 1942, Professor Edmund S. Conklin and Professor John A. McGeoch, died during that year.

Respectfully submitted,
A. T. Poffenberger
Willard C. Olson

Report of the Representative of the American Psychological Association on the American Documentation Institute

To the Council of Directors and Members of the American Psychological Association:

The annual meeting of the American Documentation Institute was held in Washington, D. C., Thursday, January 28, 1943, at Science Service. The activities of the Institute during 1942 consisted of the continued operation of the auxiliary publication service; provision of sets of microfilm; cooperation with the United States Department of Agriculture in furnishing equipment for operating Bibliofilm Service; continuation of the Oriental Science Literature Service; a conference dealing with the problems of obtaining and distributing foreign journals under war conditions; and aid in various ways on matters of scientific and scholarly documentation. The 1942 grant of the Carnegie Corporation assures the maintenance over a considerable future period of the continuing major activities of auxiliary publication, and of provision of sets of journals in microfilm. The facilities and organization of the ADI are available for furthering the objectives of any scientific groups, particularly in connection with the war and post-war plans.

The representative from the American Psychological Association was elected as the new Treasurer for the American Documentation Institute.

Respectfully submitted,
Steuart Henderson Britt

Report of the Inter-Society Color Council Delegation

To the Council of Directors and Members of the American Psychological Association:

During the past year, the normal activities of the Inter-Society Color Council have been accelerated in certain directions by War needs. In particular, the development of a more adequate test for "color blindness,"

has been going forward parallel with the work on a color aptitude test. In its function as coordinator of color information, the Council arranged a program on color blindness for its joint session with the Optical Society in March, 1943.

The council has assisted in the formulation and adoption of a color standard by the American Standards Association. It accepted the invitation to appoint a director to the board of the Munsell Color Foundation. The contact and exchange of information with the Physical Society Color group of London has been continued and increased. All these and many other similar activities are reported in the ISCC News Letter which is sent regularly to all delegates.

The establishment of the Munsell Color Foundation should have further explanation. The heirs of A. H. Munsell have placed the assets of the Munsell Color Co. in the hands of a board of directors consisting of the manager of the company, representatives of the National Bureau of Standards, the Inter-Society Color Council, and the Optical Society of America, and A. E. O. Munsell representing the donor, A. S. Allen, and I. H. Godlove. The Foundation is incorporated in the State of Maryland for the purpose of furthering research in color. It is a non-profit organization and the extent of its potential usefulness and influence may be gathered from the list of groups that are cooperating.

The News Letter continues to serve its unifying function by keeping delegates who are not able to attend meetings fully informed of the Council's activities. This is particularly important because so many delegates are now in the armed services or engaged in war work that excludes their customary regular attendance.

The delegation of the American Psychological Association has continued to take its proper part in the activities of the Color Council. The following excerpt from a report to the ISCC indicates some of those activities.

> During the year members of the American Psychological Association delegation have been widely active with problems of color. We shall do no more than point to the partial results of this activity in several cases. S. M. Newhall is reporting his work with the spacing of Munsell color at the current meeting of the OSA. Harry Helson and Elsie Murray are likewise appearing on the program. T. F. Karworki reports that he is working on depth perception for colored lights. M. J. Zigler has been obtaining data for the Color Aptitude Test as well as carrying on confidential research for the NDRC. F. A. Geldard has set up a job analysis problem within the Air Forces to determine the importance of color vision for various flying requirements. Louise S. Roland is cooperating in this study as well as carrying on other visual problems at the School of Aviation Medicine. J. P. Guilford is busy directing the work of the Psychological Research Unit #3 of the Army Air Forces, but earlier in the year made valuable contributions to the work of the Aptitude Test Committee.

In addition, M. T. Zigler is serving on the Executive Committee of the Council, and several delegates participated in the program on color blindness arranged by the ISCC for its joint meeting with the Optical Society of America in March, 1943. (See *Psychol. Bull.* 1943, **40**, 459.)

Your delegation recommends that the APA continue its affiliation

with the Inter-Society Color Council and that the present delegation be re-elected.

Respectfully submitted,
FORREST LEE DIMMICK, *Chairman*
SIDNEY M. NEWHALL, *Voting Delegate*
MICHAEL J. ZIGLER, *Voting Delegate*
FRANK A. GELDARD
CLARENCE H. GRAHAM
JOY P. GUILFORD
HARRY HELSON
THEODORE F. KARWOSKI
ELSIE MURRAY
LOUISE L. SLOAN

REPORT OF THE REPRESENTATIVE TO THE DIVISION OF PERSONNEL OF THE NATIONAL COMMITTEE FOR MENTAL HYGIENE

To the Council of Directors and Members of the American Psychological Association:

The Division of Personnel was organized four years ago to serve as a clearing center of information on all aspects of personnel work in the mental hygiene and related fields. As a basis for this work it has prepared and maintained various compilations of institutional and personal data which serve as valuable reference sources in the interests of better training and placement in psychiatry, clinical psychology, psychiatric social work and nursing.

The Division is constantly seeking to improve this aspect of the National Committee's work in order that it may become increasingly helpful in filling vacancies in important posts. But it is still more concerned with improving the quality of training in these professional specialties. However, the provision of trained personnel is a genuine need for sound growth and development in a field of professional work so highly specialized and still largely in a pioneering and enterprising stage, as is mental hygiene even today. And the need is acute, if we may judge from the varied demands to assist in finding qualified workers for positions, that have come to the offices of the National Committee for Mental Hygiene since the inception of the Division of Personnel.

As conditions in the economic world began to improve and the days of the national financial crisis and retrenchment period have faded into the background, it has been gratifying to watch the growing demand for psychologists in child and mental hygiene clinics, schools and hospitals. There has occurred a constant and steady increase in the number of requests coming to the National Committee for professional assistance, and from individuals seeking opportunities in their specialty. These latter persons have ranged from those who have merely completed their academic training and are seeking their initial experience to those well established in the field. And the requests have been nation-wide. The Division has served also as a center of information concerning training.

Until the Office of Psychological Personnel of the American Psycho-

logical Association and the Clearing House of Information on Placement of the Eastern Psychological Association came into existence a short time ago, the National Committee, so far as we are aware, was the only center of information for this group of workers. Therefore, we have been glad to cooperate with these new offices in serving the psychological field, and we remain the main psychological placement center having headquarters in New York City. The general feeling expressed by those seeking workers or employment has been one of appreciation that the National Committee has developed its facilities to include this important service.

It may be of interest to the members of the American Psychological Association to know the types of positions for which we have been able to suggest workers. They include

A children's home in the south, desiring a person for work with individual children, diagnosing their special needs, such as educational, recreational, social or emotional.

A state home and training school in the midwest.

A guidance institute serving a county in an eastern state.

A Children's Bureau in a public school system in one of the eastern coast states.

A joint position with a public welfare department and a clinic operated by a mental hygiene society in the south.

A children's home society in Virginia.

A child guidance clinic in Oklahoma.

The board of education in New York.

A child guidance clinic in a University in the south.

A state colony and training school in the south.

A private school in the east.

A family welfare society on the east coast.

The child welfare services in the southwest.

A county guidance clinic in the midwest.

A state hospital in the New England region.

A psychiatric clinic connected with a University in the northwest.

These are only a sampling of the kinds of positions that we have been called upon to aid in filling.

The war necessarily is creating a demand upon the psychological clinical field, as well as upon the psychiatric and psychiatric social work groups. And today there is a shortage of qualified male psychologists for civilian occupation. The Division has been active in an effort to direct psychologists who are entering war service to apply to the branches where their special training will be most useful; i.e., to the clinics handling the personal and family problems of the soldier and sailor. Likewise, the Director of the National Committee has been in a strategic position to aid as a consultant to those in charge of the psychological clinical facilities in the war service.

The foregoing account was prepared for your representative by Emily L. Martin, Secretary of the Division of Personnel.

Respectfully submitted,
JOSEPH ZUBIN

Report of the Chairman of the Division of Anthropology and Psychology of the National Research Council

To the Council of Directors and Members of the American Psychological Association:

The anthropologists and psychologists of the country, as organized in the Division of Anthropology and Psychology of the National Research Council have, during the past year, given most generously of their time, energies, and intellectual resources in an attempt to deal effectively with the many war problems with which they have been confronted, most of which have assumed the form of actual requests for assistance and advice from the Services and from governmental agencies working in these areas. As a result of these requests the tempo of Division activities has been an ever-increasing one, the staff and Committee personnel has expanded, and liaison has been established with virtually every branch of the armed Services and with a large proportion of governmental agencies. Projects which, before the war, tended to be of a strictly anthropological nature or a strictly psychological nature have taken on a new character with the advent of the war: it has now developed that many problems which psychologists had heretofore considered to pertain solely to their fields of specialization are being handled by anthropologists, and vice versa.

Early this spring a Committee on War Service of Anthropologists was formed in the Division for the purpose of preparing a report on *Anthropology During the War and After* in order to acquaint anthropologists outside of Washington with the many diversified activities now being engaged in by people of that profession and to orientate universities with regard to various problems and projects which might be undertaken. This report, which is enlightening, informative, and most important, has been mimeographed and may be obtained from the Division office upon request.

The Committee on the Anthropology of Oceania and the Committee on African Anthropology have published a series of confidential Personnel Lists on each of these regions, each installment containing names of individuals with experience in the region, together with pertinent information with regard to each individual. These have been distributed to authorized persons, upon request, by the Ethnogeographic Board at the Smithsonian Institution. Representatives of the Services and governmental agencies have received the strategic information embodied in the lists with the greatest enthusiasm and appreciation. Other projects, either completed or in progress in the fields covered by these two active anthropological Committees include: a special study of Western Sumatra and the islands off that coast; a Directory of Organizations in America Concerned with Oceania; a list of anthropologists having had administrative experience; the formation of a Subcommittee to be concerned with native government in Oceania; the preparation of a series of *Strategic Bulletins of Oceania;* a list of native Africans living in the United States; a Bibliography of North Africa, which, although still in a state of preparation, is constantly being utilized by the Services; a series of maps with tribal index; and a compilation of native names of diseases in Africa. The

Ethnogeographic Board has been of invaluable assistance in the dissemination of materials provided by these two Committees.

The Committee on Food Habits, an advisory research committee complementing the Food and Nutrition Board, administered by the Division of Biology and Agriculture, now operates with the Nutrition and Food Conservation Branch of the Food Distribution Administration of the U. S. Department of Agriculture. This Committee, under the able direction of its Chairman, Dr. Carl E. Guthe, and its Executive Secretary, Dr. Margaret Mead, has continued to conduct investigations in various parts of the country on nutrition and food habits and to issue reports on these studies. The Committee has been actively engaged in compilations, such as attitude sampling, confidential reports, and dietary patterns of minority groups. A series of conferences have been held throughout the year, which have taken the form of liaison sessions, group meetings, and meetings arranged by the Executive Secretary to bring together local groups in various parts of the country.

The Committee on Child Development, under the chairmanship of Dr. R. S. Woodworth, held a Conference on War and Postwar Child Services and Research in Chicago and Washington on March 19 and 20, 1943. Because of the lack of funds, the deliberations of the Conference were focussed around plans for work which might be undertaken with a minimum of financial assistance, and committees were formed to initiate plans for (1) Child Accounting, (2) Minimal Research Requirements During the War and Reconstruction Period in the United States and Abroad, and (3) Research Problems for Intensive Investigation. The Society for Research in Child Development, with offices in the National Research Council, has continued the publication of the *Child Development Quarterly*, the *Child Development Abstracts and Bibliography*, and *Monographs of the Society for Research in Child Development.* Receipts from membership dues and subscriptions to the journals provide a fund by means of which the publication program may be continued.

The Committee on Classification of Military Personnel Advisory to the Adjutant General's Office has continued its important and effective work under the chairmanship of Dr. Walter V. Bingham. During the year it has dealt with such problems as pre-induction screening, the sorting of newly inducted troops, and the selection of officers with leadership ability. In an attempt to solve another problem with which the Committee has been faced, a subcommittee of five, known as the Advisory Board on Mechanical and Technical Personnel, has recently been organized. This Board will explore new means of selecting men who have an aptitude for, and may be trained in, mechanical occupations of various kinds.

Through its many contacts with the Services and governmental agencies during the past year the Emergency Committee in Psychology, under the chairmanship of Major Karl M. Dallenbach, has continued to formulate policies, plan, and advise. Through the activities of its various subcommittees and special committees many extremely important ideas have been brought to the attention of the Committee for transmittal to the Services and appropriate branches of the Government. These include: the improvement of training procedures in the learning of International

Morse Code; the training of illiterate soldiers; the detection of mental defectives in the Army Specialized Training and Induction Station Testing Programs; the advancement of the work of women psychologists in connection with the war; the advancement of plans for psychological readjustment in the postwar period; the addition of psychology to the curriculum of the Army Specialized Training Program and the training of 800 men per year in Personnel Psychology; and suggestions as to deferment policy for psychologists. Other projects of the Committee have included: the publication of PSYCHOLOGY FOR THE FIGHTING MAN, under the editorship of Dr. E. G. Boring; the formation of a Subcommittee on Problems of Leadership; the formation of the Subcommittee on Survey and Planning, which has acted as an overall planning and advisory group and at whose suggestion the Intersociety Constitutional Convention of Psychologists was held; the listing of psychologists' activities and of translators; and the routing of various research projects to universities.

In February, 1943, the Office of Psychological Personnel, under the direction of Dr. Steuart Henderson Britt, began its second year of activity, functioning as a clearing house of information through which governmental and military agencies have been able to obtain the names and qualifications of individuals eligible for appointment and as an advisory agency for those desiring to be of help in the war effort. The Office has been supported by the National Research Council, the American Psychological Association, the American Association for Applied Psychology, the Society for the Psychological Study of Social Issues, and the Society of Experimental Psychologists. Following Dr. Britt's resignation on June 1, 1943, Dr. Donald G. Marquis accepted the directorship of the Office. Dr. Britt is now a Lieutenant in the U. S. Naval Reserve.

The Committee on Latin-American Psychology, under the chairmanship of Dr. J. G. Beebe-Center, has become a subcommittee under the Joint Committee on Latin-American Studies, along with anthropological committees in this area. A series of articles on psychology in various South American countries is in process of appearing in psychological journals. Exchanges of periodicals with Latin America have been arranged in the case of certain of our psychological journals, and reviews of Latin-American psychology books have appeared in journals in this country.

The Committee on Problems of Neurotic Behavior, under the chairmanship of Dr. Walter R. Miles, has continued in its sponsorship of *Psychosomatic Medicine* and *Psychosomatic Medicine Monographs*. One monograph, THE SEXUAL CYCLE IN WOMEN, constituting the first part of Volume III, has been published during the year. In December, 1942, the American Society for Research in Psychosomatic Problems was formed, subscription to *Psychosomatic Medicine* being made a part of the membership dues. The Subcommittee on Personality Inventory has been deleted from the roster of Divisional Committees, the purpose for which it was organized having been fulfilled.

Through contractual arrangement with the Civil Aeronautics Administration, the Committee on Selection and Training of Aircraft Pilots, under the chairmanship of Dr. Morris S. Viteles, has, during the year,

again been generously financed. Dr. Jack W. Dunlap resigned as Director of Research for the Committee in the Fall of 1942 to accept a commission as Lieutenant Commander in the U. S. Naval Reserve but has continued his affiliation with the Committee as a member of the Executive Subcommittee. Dr. Robert Y. Walker, of Ohio State University, and Mr. Morey J. Wantman, of the University of Rochester, have been acting as Director of Training and Director of Testing, respectively. Since the formation of this Committee in 1939 the emphasis has been on research, but now it is possible to apply the findings of this research. Many interesting aspects of the Committee's work have developed, among which might be mentioned: the CAA-National Testing Service, which was designed for uniform administration and scoring of tests used throughout the country for screening candidates for training in the Army phase of the Civilian Pilot Training Program; the development of PATTER and FUNDAMENTALS OF BASIC FLIGHT MANEUVERS, which have been utilized in the War Training Service Program and by the Navy; the preparation of a Textbook on Aviation Psychology, which is being undertaken under the editorship of Dr. Norman L. Munn; the publication of a popular article on *How to Prevent Airsickness*, which constituted one of the outcomes of an investigation in that field by Dr. G. R. Wendt; a Training Institute for Pilot Instructors, held at the request of the War Training Service at the University of Minnesota, April 1–10, 1943, material for the course consisting of Standard Lesson Plans prepared by the staff of the Committee; the continued publication of reports of research sponsored by the Committee since its inception; and the development of certain recording instruments.

There has developed in the Division during the past year another Committee dealing with selection and training problems—the Committee on Service Personnel—Selection and Training, with Mr. John M. Stalnaker as Chairman and Dr. Charles W. Bray as Executive Secretary. This Committee acts in an advisory capacity to various Service groups, recommends important experimental projects to the National Defense Research Committee, and supervises those projects which have been contracted for by the National Defense Research Committee. The Committee and its subcommittees have held frequent meetings to deal with the numerous requests which come from the Services.

Three applications for fellowships in the Natural Sciences for the year 1943–1944 were received in the Division, all of them being requests for fellowships in psychology. Following review of the applications by the psychological members of the Committee on Fellowships and by the National Research Fellowship Board, Dr. Herman A. Witkin, Ph.D., New York University, 1939, was appointed to the sole fellowship awarded in the Division. Dr. Witkin's research on *The Role of Visual and Postural Factors in the Determination of the Constancy of the Perceived Vertical and Horizontal* is to be done at the New School for Social Research under the direction of Dr. Max Wertheimer.

Respectfully submitted,
LEONARD CARMICHAEL

Report of the Representative to the Social Science Research Council

To the Council of Directors and Members of the American Psychological Association:

The organization of the Social Science Research Council is such that Psychology is called upon to join forces with Sociology, Economics, History, Political Philosophy, Anthropology, and Statistics for the general advancement of Social Science. Theoretically, one should look, therefore, for rather broad developments upon the whole Social Science Front and should be equally interested in whatever advances occur. Actually, advances are made by sectors here as elsewhere and in some of these the psychologists will be more interested than in others. But even when individual projects are examined they will be found to be the joint responsibility of two or more of the Social Sciences. Thus the monograph by G. W. Allport on *The Use of the Personal Document in Psychological Science*, published last year, is one of a series of similar studies in the fields of Sociology, Economics, History, and Anthropology directed toward the general goal of improvement in the use of the personal document. It is planned to gather these reports into three volumes of which the Allport study will be Volume I. Likewise, the various appraisals of research which have been in progress for several years, and which have dealt with specific publications are directed toward the general improvement of research in the Social Sciences.

A number of memoranda on Social aspects of the war have been prepared by the Committee on Social Adjustment. They outline research projects which can be carried on in one's own community and with little or no financial support. In addition to the one mentioned in the report of last year on methods of studying public opinion, there are memoranda on: *War and Crime*, *Internal Migration*, and *Vital Phenomena as Affected by the War*. Still other reports will follow.

The study of foster children carried on by Barbara Burks under the Committee on Social Adjustment has been abruptly halted by her untimely death. An attempt is being made to prepare for publication the data which she had accumulated.

A project that should be of especial interest to psychologists has grown out of the recognition of a need for repetition of research for purposes of verification. The raw data of several researches in Sociology are being subjected to independent analysis by different investigators, using different techniques and attacking the analyses from differing points of view. Reports of these "repeat" studies will be published shortly. It is hoped that they will serve as an example to be followed in the other Social Sciences.

A Survey of Objective Studies of Psychoanalytic Concepts prepared by Robert R. Sears for the Committee on Social Adjustment was published as Council Bulletin No. 51. It has had a larger immediate sale than any other Council Bulletin. It is hoped that such a wide distribution of the report will stimulate further critical study and research in this important field.

The Social Science Research Council has set up an office in Washington, D. C. to serve as a clearing house and coordinating center for Social Science personnel and for Social Science problems arising out of the war emergency. It is under the direction of Dr. Donald Young of the Council staff. It is intended to be of service to psychologists as to all the other Social Sciences, although the Office of Psychological Personnel serves adequately the more immediate needs of the former.

The changing character of the fellowship situation in very recent years was examined by a special committee of the Council under the chairmanship of R. S. Woodworth. Few essential modifications in the current program were recommended. Careful study is being made by the Council of the probable post-war Fellowship problem. The number of fellowship applications in 1943 was 69 as compared with 89 last year. The number granted was 15 this year as compared with 20 last year. There were 10 applicants in the field of psychology of which one was granted to Dale Harris of the University of Minnesota for study with E. W. Burgess at the University of Chicago. Last year there were 11 candidates and two awards.

There was a sharp reduction in requests for grants-in-aid, from 97 in 1942 to 57 in 1943. For psychology the number fell from 15 to 7, and the grants from 6 to 2. Both the fellowship and the grant-in-aid figures reflect the war emergency.

The newly elected representative is W. S. Hunter, who succeeded Mark A. May.

Respectfully submitted,
A. T. POFFENBERGER

REPORT OF THE TREASURER AND BUSINESS MANAGER OF PUBLICATIONS

To the Council of Directors and Members of the American Psychological Association:

I am transmitting herewith the audited accounts of the American Psychological Association and its publications for the year January 1, 1942 to December 31, 1942, the details of which are shown by the accompanying audited schedule. The following paragraphs are a resume of the most important points in the audited accounts.

The acquisition of the *Journal of Applied Psychology* before the close of the year changes the financial picture somewhat because the Association assumed a liability of $10,000 in the transaction. As a consequence although various divisions operated for the year with a net surplus of $3,884.95 and the assets increased to $99,632.20, this liability, and others, reduced the net worth of the Association from $56,240.05 as of December 31, 1941, to $50,151.99* as of December 31, 1942.

It is planned to liquidate this liability from the yearly operations of the *Journal of Applied Psychology* over a period of ten years starting January 1944.

* The net worth of the Association is conservatively estimated and does not include some $14,000 representing reserves for special purposes, the details of which are given in the balance sheet.

The purchase of th enew journal does not affect the statement of income and expense which shows a total net income of $4,709.64. The amount of cash received into the treasurer's office was some $3,500 more than the previous year because of an increased proportion of dues diverted from the publications in anticipation of heavy expense of the Office of Psychological Personnel. As in previous years the total ordinary non-publication expenses amounted to about $6,000, but the unusual expense for the Office of Psychological Personnel, which was almost $5,000, resulted in a deficit of $46.36 in this account.

There was a general increase in the cost of printing rates for all the journals due to wage increases that were allowed at various times during the year. Insofar as possible the resulting increase in cost per page was absorbed by reducing the number of pages printed, but even so a gradually increasing size of each edition is a contrary factor which frequently overbalances this attempt at compensation. The total printing costs for all journals was $26,533.91 in comparison with $26,303.88 in the previous year; but 24,000 more units were produced, bringing the total to 128,000.

The *Bulletin* presents the only serious deficit among the journals.

It amounted to $662.01 and was caused principally by a decrease in the sale of back numbers, which varies in an unpredictable fashion over a period of years, and by an increase in printing costs of about $750.

The *Journal of Abnormal and Social Psychology* ended the year with a balance of $763.08 which was added to the surplus of the journal, bringing this amount to $5,674.83.

The number of club rate subscriptions increased from 551 at $8.00 in 1941 to 687 at $7.50 each in 1942.

Aside from the usual routine, the work of the Business Manager concerned preparations for the purchase of the *Journal of Applied Psychology*. The routine was unusually heavy because of the numerous changes of address occasioned by the war. To December, 1942, about 3000 changes were made in a list of less than 3300.

Respectfully submitted,

WILLARD L. VALENTINE, *Treasurer and Business Manager*

CONDENSED REPORT OF EXAMINATION
AMERICAN PSYCHOLOGICAL ASSOCIATION, INC.
YEAR ENDED DECEMBER 31, 1942

Auditor's Certificate

March 3, 1943

American Psychological Association, Inc.,

We have examined the balance sheet of the American Psychological Association, Inc. as of December 31, 1942, and the statements of income and expense and net worth for the year then ended, have reviewed the accounting procedures of the Association and, without making a detailed audit of the transactions, have examined or tested accounting records of the Association and other supporting evidence, by methods and to the extent outlined in this report.

A summary of the balance sheets at December 31, 1942, and December 31, 1941, follows:

Assets	Dec. 31, 1942	Dec. 31, 1941	Increase Decrease*
Cash	$58,746.61	$75,741.04	$16,994.43*
Marketable securities	37,962.08	12,910.01	25,052.07
Accounts receivable—net	3,202.11	2,735.74	466.37
Inventories:			
Valuation placed on stock of back numbers of publications	1.00	1.00	
	$99,911.80	$91,387.79	$ 8,524.01
Liabilities and Net Worth			
Accounts payable	$ 2,835.20	$ 3,331.73	$ 496.53*
Contract payable	10,000.00		10,000.00
Deferred income:			
Unexpired subscriptions	23,027.83	23,838.88	811.05*
Reserved for special purposes	13,896.78	7,977.13	5,919.65
Net worth	50,151.99	56,240.05	6,088.06*
	$99,911.80	$91,387.79	$ 8,524.01

The following comments relate to the accompanying financial statements and to the scope of our examination:

Cash on demand deposit and in savings accounts was reconciled with the amounts reported directly to us by the depositaries, and cash for deposit was received early in January according to advice from the bank. Office cash funds were confirmed by direct correspondence with the custodians thereof. The records of cash transactions for the year were checked by comparisons of the totals of cash receipts recorded in the cash book with deposits shown in monthly bank statements and by inspection of paid checks, invoices or other data on file in support of the recorded disbursements.

Marketable securities, which were presented for our inspection, are shown below:

	Interest Rate	Cost	Market Value Dec. 31, 1942	Accrued Interest Dec. 31, 1942
U. S. Savings bonds—Series G, due November 1, 1953	2½%	$ 5,000.00	$ 4,890.00	$ 20.83
U. S. Savings bonds—Series G, due December 1, 1954	2½%	25,000.00	25,000.00	52.08
		$30,000.00	$29,890.00	$ 72.91
Chesapeake & Ohio Railway Co., refunding and improvement mortgages, Series G, due February 1, 1960	2 6/10%	7,802.50	7,760.00	86.67
Totals		$37,802.50	$37,650.00	$159.58

The amount stated for accounts receivable was in agreement with the total of a listing of the individual accounts. We did not correspond with the debtors for confirmation of the balances due. The Association follows the policy of recording dues of members and associates when they are

received; therefore, no asset amount is stated in the balance sheet for unpaid dues.

The receivables from Dr. James P. Porter represent the unexpired portion of subscriptions received by him to the *Journal of Applied Psychology* as of December 31, 1942. The Association purchased this Journal from Dr. Porter for the sum of $10,000.00 on that date.

Inventories of back numbers of publications, carried in the balance sheet at $1.00, are summarized and shown in a schedule included later in this report.

All ascertained liabilities of the Association at December 31, 1942, have been provided for in the accompanying balance sheet.

A summary of the account of the Committee on Aid to Displaced Foreign Psychologists is presented in the following:

Amount appropriated in 1942 (included in committee expense of treasurer's office)		$200.00
Excess of expenses over income for prior years previously charged to net worth	$26.99	
Expenses of the committee for the year 1942	42.55	69.54
Unexpended balance at December 31, 1942		$130.46

Deferred income represents the unexpired portion of subscriptions to the various publications of the Association at December 31, 1942. We tested the computations of the Association with respect to the amounts deferred to cover the unexpired subscriptions.

Information submitted to us indicated that certain funds reserved for specific purposes were not to be considered a part of the general funds of the Association. The Council has authorized cash in the amount of $3,126.99, carried in a special savings account in the Peoples Savings Bank in Providence, to be used for post-war reconstruction of psychology. This amount represents the unexpended balance of funds received for the ninth international meeting plus accumulated interest thereon to December 31, 1942. Under the terms of a gift whereby the Association acquired the *Journal of Abnormal and Social Psychology*, any surplus funds arising from its publication are to be used solely for purposes of that journal. The amount of such surplus funds at December 31, 1942, was determined as follows:

Balance at January 1, 1942	$4,911.75
Net income from operations for the year—as shown by accompanying statement of income and expense	763.08
Balance at December 31, 1942	$5,674.83

Opinion

In our opinion, the accompanying balance sheet and statements of income and expense and net worth present fairly the position of the American Psychological Association, Inc. at December 31, 1942, and the results of its operations for the year, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Ernst & Ernst
Certified Public Accountants

BALANCE SHEET
AMERICAN PSYCHOLOGICAL ASSOCIATION, INC.
December 31, 1942
ASSETS

Cash			
Demand deposit	$11,592.27		
For deposit	15,244.32	$26,836.59	
Savings accounts ($8,801.82 reserved for special purposes)		31,844.06	
Office cash funds		65.96	$58,746.61
Marketable Securities			
U. S. Savings bonds—at cost	$30,000.00		
Railroad bonds—at cost	7,802.50	$37,802.50	
Accrued interest on bonds		159.58	37,962.08
Accounts Receivable			
For sales, reprints, printing costs, etc.	$ 1,744.61		
Less reserve	872.30	$ 872.31	
Due from Dr. James P. Porter for subscriptions to Journal of Applied Psychology		2,329.80	3,202.11
Inventories			
Valuation placed on stock of back numbers of publications			1.00
			$99,911.80

LIABILITIES AND NET WORTH

Accounts Payable		
For printing costs and expenses	$2,652.08	
To authors of Psychological Monographs	183.12	$ 2,835.20
Contract Payable		
Due to Dr. James P. Porter for purchase of Journal of Applied Psychology—payable $83.33 per month beginning January 31, 1944		10,000.00
Deferred Income		
Unexpired subscriptions to:		
Psychological Abstracts	$8,253.01	
Journal of Experimental Psychology	4,159.01	
Psychological Bulletin	2,325.38	
Psychological Review	1,779.48	
Journal of Abnormal and Social Psychology	1,998.15	
Psychological Monographs	1,190.50	
Journal of Applied Psychology	3,322.30	23,027.83
Reserved for Special Purposes		
Funds to be used for post-war reconstruction of psychology	$3,126.99	
Surplus funds of Journal of Abnormal and Social Psychology	5,674.83	
	$8,801.82	
Assessment from members for maintenance of Office of Psychological Personnel for the year 1943	4,964.50	
Unexpended balance of appropriation to Committee on Aid to Displaced Foreign Psychologists	130.46	13,896.78
Net Worth		
Balance at December 31, 1942		50,151.99
		$99,911.80

Statement of Net Worth
American Psychological Association, Inc.
Year ended December 31, 1942

Balance at January 1, 1942			$56,240.05
Add:			
Excess of expenses over income of Committee on Aid to Displaced Foreign Psychologists for prior years charged to current year's appropriation			26.99
Net income for the year—as shown by accompanying statement of income and expense		$4,709.64	
Less portion of net income reserved for special purposes:			
Net income of Journal of Abnormal and Social Psychology	$763.08		
Interest on funds to be used for post-war reconstruction of psychology	61.61	824.69	3,884.95
			$60,151.99
Deduct cost of Journal of Applied Psychology			10,000.00
Balance at December 31, 1942			$50,151.99

Income and Expense
American Psychological Association, Inc.
Year ended December 31, 1942

	Total	Treasurer's Office	Journal of Abnormal and Social Psychology	Psychological Abstracts	Psychological Review	Psychological Bulletin	Journal of Experimental Psychology	Psychological Monographs
Income								
Dues:								
Members	$ 4,593.82	$ 4,593.82						
Associates	5,624.61	5,624.61						
Subscriptions:								
Members and associates	15,261.44			$12,863.94		$2,397.50		
Special combination	5,152.50		$ 687.00		$ 858.75		$2,576.25	$1,030.50
Others	17,593.05		2,851.69	3,575.73	3,200.24	2,758.65	4,209.15	997.59
Reprints of prior publications	2,958.91		498.31		383.85	577.76	1,498.99	
Sale of single copies and back numbers	1,975.40		530.26	318.62	411.35	197.18	117.38	400.61
Collections from authors for printing costs	1,049.49							1,049.49
Interest on savings accounts	702.78	668.13	34.65					
Interest on investments	385.07	385.07						
Advertisements	337.21			310.54			26.67	
Miscellaneous, including allocation of general income	294.25	157.45	6.83	57.33	11.12	41.05	13.65	6.82
	$55,928.53	$11,429.08	$4,608.74	$17,126.16	$4,865.31	$5,972.14	$8,442.09	$3,485.01
Expense								
Compensation to employees	$ 5,079.78		$ 154.30	$ 3,189.86	$ 346.89	$ 925.83	$ 308.60	$ 154.30
Allowances to officers and editors	6,360.22	$ 2,411.04	200.00	2,899.18	200.00	200.00	400.00	50.00
Printing costs	26,533.91	580.42	2,870.32	6,243.85	3,033.96	4,555.81	6,295.41	2,954.14
Reprints	2,340.38		406.42		437.85	490.04	1,006.07	
Abstractors and translators	479.64			479.64				
Office supplies and expense	1,382.07	568.26	34.28	504.40	41.49	155.59	51.86	26.19
Miscellaneous, including allocation of general expense	1,174.34	356.35	69.99	246.87	54.03	303.75	66.54	76.81
Yearbook	1,176.68	1,176.68						
Payments to authors	146.12							146.12
Provision for doubtful accounts	137.06		110.35	4.81*	40.12*	3.13	15.76*	84.27
Professional services	337.50	337.50						
Annual meeting expense	450.53	450.53						
Committee expense	623.30	623.30						
Office of Psychological Personnel	4,971.36	4,971.36						
Equipment purchased	26.00			26.00				
	$51,218.89	$11,475.44	$3,845.66	$13,584.99	$4,074.10	$6,634.15	$8,112.72	$3,491.83
Net Income	$ 4,709.64	$ 46.36*	$ 763.08	$ 3,541.17	$ 791.21	$ 662.01*	$ 329.37	$ 6.82*

* Indicates negative amount.

Budget for 1944

Treasurer's office
Based on 2800 Associates, 600 Members
Abstracts $3.00; Bulletin $.75

Estimated Income

Dues (M 6.50, A 2.75)	$10,020.00
Subscriptions	
Abstracts	9,900.00
Bulletin	2,550.00
Interest	1,000.00
Sale of Yearbooks and Programs	
Assessment ($2.00 per Member and Associates)	6,700.00
	$30,170.00

Estimated Expenses

Subscriptions	
Abstracts	$ 9,900.00
Bulletin	2,550.00
Office Supplies and Expense	500.00
Telephone and Telegraph	100.00
Printing	500.00
Proceedings	600.00
Yearbook	1,500.00
Treasurer's Bond	100.00
Secretary's Stipend	2,000.00
Treasurer's Stipend	400.00
Auditing accounts	375.00
Incidentals, Annual Meeting	300.00
Intersociety Color Council	25.00
Membership in American Council on Education	10.00
Program Committee	50.00
Office of Psychological Personnel	10,000.00
Committee on the Constitution	600.00
Contingency Fund	1,000.00
	$30,510.00

PSYCHOLOGY AND THE WAR

Edited by

DONALD G. MARQUIS

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AGENCIES FOR REHABILITATION AND VOCATIONAL READJUSTMENT

DONALD G. MARQUIS
Office of Psychological Personnel

The problems of demobilization after the war are of such magnitude that no comparisons can be found. Ten million or more men and women in the armed services, and twenty million or more in civilian war work of various kinds will require occupational readjustment. The period of mobilization of this vast force has been spread over only four years; during the demobilization period the pressure for speed will be even greater.

The problems of rehabilitation of the injured, and of vocational guidance and training are of special interest to psychologists. This review will present a short description of the existing facilities and agencies concerned with these problems. The information has been secured by interviews with the national directors of the several agencies, and when possible from published laws, administrative orders, and bulletins. The following statements should not be construed as official.

Army and Navy Services. Members of the armed forces who suffer physical injury or who are psychiatrically disabled are cared for in service hospitals before they are discharged. In addition to the more usual medical care, such men will receive physical and occupational therapy; they will be provided with artificial limbs, and with artificial aids for hearing and visual impairment, and will be trained in the proper use of such appliances. They will also receive counsel and training to help in their adjustment to their disability. Clinical psychologists and rehabilitation training workers are now employed in several of the service hospitals and it is expected that many more will be utilized in the near future.

A consultation service or mental hygiene unit, has been established in many of the training centers of the Army and Navy. Such units ordinarily comprise psychiatrists, psychologists and social workers, and are attached to headquarters staff under cooperative supervision of the office of the Surgeon General. Men who present individual problems of adjustment are referred for careful and comprehensive study leading to recommendations for therapy, discipline, reassignment, hospitalization, discharge, etc. When discharge is carried out, the Red Cross is utilized as liaison for continued service by civilian agencies. The operation of a mental hygiene unit will be described in an article by Lt. Col. Louis L. McQuitty to be published in the December issue.

Whether the Army and the Navy will undertake a systematic program of vocational counseling and training for all demobilized men has not been announced. Both services have a large group of carefully selected and experienced personnel workers who were responsible for the classification of the civilian draft army into military occupations. The record card for each soldier contains a wealth of valuable information: his civilian work history, his numerous aptitude scores, and his in-service technical training and experience. It seems possible that the classification process could be operated in reverse at the time of demobilization.

Veterans Administration. In March of this year Congress amended the veterans legislation to provide more adequate vocational rehabilitation for persons with service-connected disabilities (2). The work is now being organized as the Vocational Rehabilitation Service, under the directorship of H. V. Stirling. The central administration in Washington includes a Vocational Advisement Division, a Training into Employment Division, and a Research Division. The actual operations will be carried out at the 53 Regional Offices of the Veterans Administration, which are located in the various states and territories.

Each Regional Office will establish a Vocational Rehabilitation Division under the direction of a Vocational Rehabilitation Officer. Additional personnel such as Vocational Advisers and Training Supervisors will be appointed as found necessary. Recruitment for these positions by the U. S. Civil Service was begun in August. There is also provision for the utilization of consultants where it is considered advisable.

Any veteran whose disability is such as to entitle him to a pension is eligible for the rehabilitation services of vocational counseling and of free vocational training for as long as four years. The vocational advisers are directed to utilize the occupational aids described by C. L. Shartle in a later paper in this issue, and are given the following instruction regarding tests:

> As sources of information regarding the aptitudes and abilities, including the general level of mental ability, and the occupational level of persons receiving vocational advisement, the vocational advisers will use any obtainable data regarding the abilities manifested by past performance in actual employment or indicated by the results of such aptitude and ability tests as have previously been administered, if the recorded results of such tests are made available, or by the results of the application of tests approved by central office to be administered by personnel properly trained and experienced in the technique of administering such tests. Until further instructions are issued on this subject, the use of such tests should be limited to small quantities of those which are generally available

commercially and recognized by competent authorities on the use of such tests as being standard and highly reliable. Such a test must not in any instance be administered by any person untrained in the use of it. (3).

Vocational Rehabilitation Division of the Federal Security Agency. Physically handicapped individuals whose disability is not service-connected are cared for by the Vocational Rehabilitation Division, Michael Shortley, Director. This agency was established in 1920 within the Office of Education in the Department of the Interior. It has recently been transferred to the Federal Security Agency.

Actual procedures are carried on by the State Departments of Vocational Rehabilitation which are supported by joint Federal and State funds. Congress acted in July to increase the Federal funds available for the joint operation of the services, and to provide for more effective coordination and control of the State Divisions. There is at present no provision for the appointment of psychologists as such, but several are working in various states as Rehabilitation Officers.

The magnitude of the task confronting the Vocational Rehabilitation Division may be judged from the estimate that there are approximately 4,000,000 persons with permanent physical impairments, of which half are either employed or trying to find work. The U. S. Office of Education estimates that each year approximately 80,000 physically handicapped workers should have occupational-adjustment service in order to find employment (5), and it may be expected that this number will be much greater as the result of the expansion of war industry.

The Rehabilitation Divisions of each State provide physical restoration, vocational training, and vocational guidance for any handicapped person. The nature of the vocational guidance work is described in a bulletin issued by the U. S. Office of Education (4). The utilization of psychological services in an expansion of a state rehabilitation service is described in the succeeding article in this issue.

The three types of agencies described above are concerned with disabled individuals of three classes: members of the armed forces, veterans, and civilians. But the problem of occupational readjustment of those not disabled is just as pressing and is many times as great in magnitude. This phase of the rehabilitation problem is not yet fully worked out, but the following existing agencies are necessarily involved.

U. S. Selective Service. Acts of Congress dealing with the Selective Service System provide that persons who have left govern-

ment employment or private employment to enter the armed services shall on completion of their service be reemployed in the same or in comparable positions. To accomplish this goal Selective Service has established a Reemployment Division, under the direction of Colonel Sanders. Special Reemployment Committeemen have been appointed to serve on a voluntary basis with the 6450 local draft boards. These committeemen will act as personal representatives for the ex-service man in helping him find reemployment.

The local draft boards expect to cooperate in the reemployment work with existing agencies such as the American Red Cross, the Veterans Administration, the State Vocational Rehabilitation Services, and the U S. Employment Service. But there is no provision for the utilization of professional personnel by the Selective Service. Psychologists in university departments, clinics, or public and private social agencies, who are able to offer voluntary service in vocational guidance may get in touch with the State Director of Reemployment in Selective Service, or with state or local committees where such have been established.

Vocational Training Opportunities. Provision for education and vocational training is a necessary part of any readjustment program. Existing law now provides free training for physically-handicapped men, both service and non-service. No specific provision has been made to provide training for those who are not disabled (6).

It is the task of those responsible for vocational guidance to place and supervise the individuals in suitable training courses. Many agencies will be involved in post-war training: public schools, colleges, technical institutes, labor unions, churches, and clubs, as well as specially created courses. Many of the latter have been set up to care for the needs of war mobilization and might be oriented for post-war needs. These courses have been coordinated by Federal agencies in the U. S. Office of Education and in the War Manpower Commission.

U. S. Employment Service. The Division of Employment Service of the War Manpower Commission with its regional and state organizations and with the local U. S. Employment Services will be primarily responsible for the vocational placement of individuals. These agencies have been established for some time and have a background of experience and skill which make them a necessary part of the readjustment process. It is expected that all agencies,

Army, Navy, and civilian, will utilize the Employment Service for placement. A description of the occupational aids which have been developed by extensive research for improving the placement service is presented in a later paper in this issue by C. L. Shartle.

Possible Future Developments. It is apparent that most adequate provision has been made for the rehabilitation, training, guidance, and placement of disabled service personnel and civilians. There is at present no over-all coordination of similar services for the remaining service men and war workers who will require occupational readjustment. In July, 1942, President Roosevelt authorized the appointment of a Conference on Post-War Readjustment of Civilian and Military Personnel, Floyd W. Reeves, Chairman, to study this broad problem and to report to the National Resources Planning Board. The final report was published in June, 1943 (1). Recommendations were made concerning the general plan of demobilization, benefits for service men, industrial conversion for full employment, and rehabilitation, training, vocational counseling and placement. Of particular interest to psychologists are the following recommendations of the Conference:

At the ports of debarkation that are also demobilization centers and at other demobilization centers, there should be created readjustment centers to provide vocational and educational information and guidance for those being demobilized from the services.

In the chief centers of war industry, readjustment centers should be established to assist civilian war workers. Such centers should have available the types of service which could be offered by government agencies.

A strong central directive agency should be established in the Federal Government for the integration of the administration of all Federal agencies engaged in the post-war readjustment of civilian and military personnel, and for such planning as may be appropriate thereto. Because of the urgent need for action well in advance of the termination of the war, the central directive agency should be established without delay (1, pp. 105–106).

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THE ROLE OF PSYCHOLOGY IN A REHABILITATION PROGRAM

DOROTHY P. MARQUIS, *Yale University,*
FREDERICK W. NOVIS, *Connecticut State Dept. of Vocational Rehabilitation,*
AND
S. MEDFORD WESLEY, *Yale University*

The urgent need for the full utilization of manpower created by the war has brought into clear focus the problem of rehabilitating individuals who are physically handicapped. Although for the past twenty years facilities have been available for rehabilitation services, earlier service stressed medical diagnosis, provision of hearing aids, visual aids, artificial appliances, etc., to a greater degree than occupational diagnosis, vocational selection and guidance, and training. However, there has been increasing emphasis on the problem of vocational guidance until at the present time psychological diagnosis and recommendations have become an integral factor in the program.

Vocational rehabilitation service in Connecticut, which this paper will describe briefly, was inaugurated in 1930, under the direction of the State Board of Education. It was established to provide vocational guidance; vocational training for all types of suitable occupations; artificial appliances, including hearing-aids, where required as part of the preparation for employment; supplies, work tools and other equipment needed in the course of training; and aid in securing employment suited to the particular physical defect of the individual.

Early in 1942 a program was set up which involved a fuller utilization of psychological techniques and methods. One phase of this program was introduced on March 15, 1942, when the first Rehabilitation Clinic was held at Yale University. The aim of the Clinic was to bring the handicapped client into contact with the employer and to present to the employer an evaluation of the individual's vocational potentialities in terms of his physical handicap, his occupational and educational backgrounds, and his psychological aptitudes. Before the Clinic was held, the following types of information about the client were obtained:

(1) the medical diagnosis with recommendations concerning the client's physiological limitations and his fitness for work;

(2) psychological evaluation of his intelligence, aptitudes, personality, etc.;

(3) background information including educational and occupational history, family relationships, duration of handicap, etc.

The Clinic involved the assembling at one conference of the clients, the employers, representatives of training agencies, representatives of the U. S. Employment Service, and the specialists concerned with the diagnosis of the individual's capacities (rehabilitation supervisors, psychologists, physician).

The conduct of the Clinic, in which each client was individually considered, was in general as follows:

(1) Presentation of occupational, educational, medical, and psychological information about the handicapped person to the Clinic Conference Group. These facts were presented by rehabilitation supervisors, clinic physician and clinic psychologist, in the absence of the physically handicapped person who waited in an adjoining room.

(2) Presentation of the handicapped person. This involved a brief informal interview in which the client was given a full opportunity to express himself freely about his desires, his likes, and his problem. Clinic participants were invited to question the client with regard to his interests, his training, and his job goals.

(3) Discussion to clarify information and to formulate recommendations after the client had left the room. This was the most important phase of the clinic session, providing the integration of information between the Clinic specialists (rehabilitation supervisors, psychologists, physicians) and the employers. This allowed employers an opportunity to secure a well rounded summary of the occupational, physical, and mental capacities of each client. Recommendations were formulated and accepted on the basis of this interchange of information and suggestions.

(4) Clinic follow-up. Recommendations fell usually in one of the following categories: (1) Ready for selected placement in a specified occupation, (2) Vocational training, (3) Arrangement of appliance, (4) Further psychological study, (5) Job training, (6) Further medical study. It was part of the Clinic action to pave the way for positive moves in the direction of Clinic recommendations. In many cases, referral for further study, or for training arrangement, or to job openings was made immediately or early the following day. Each phase of the client's progress was carefully followed so that the success of the adjustment could be determined.

To date twenty similar Clinics have been held at various industrial Connecticut cities. The clinical procedure has given the authors an opportunity to study the validity of recommendations made on the basis of appropriate psychological tests, and to follow up the success of adjustment of a varying group of handicapped individuals.

The selection of appropriate psychological tests to use in the Clinics was done carefully and with full consideration to the validity of a test score for a particular handicapping condition. In per-

sons with motor defects, such as amputations of limbs or arms or fingers, or atrophy or deformity of an extremity, or motor incoordination, care had to be exercised in valid measurement. In case of sensory defects, such as vision or hearing restrictions, the psychologists had to determine the suitability of certain tests in view of these conditions. Other defects such as respiratory and circulatory defects found in such handicapping conditions as arrested tuberculosis, cardiac conditions, hypertension, etc., imposed fewer restrictions in psychological testing.

In spite of these limitations it was found both feasible and necessary to work out a program of some group testing. Only those who had eighth grade education or better, were able to read and write easily, and had no severe sensory defects were handled in the group testing. At least half of the people who came to the Clinic had eighth grade education and a large number of them were still young and anxious to be prepared to enter remunerative employment. In order to increase the number of clients examined it was found possible to give intelligence tests and certain of the pencil-and-paper tests in groups of 20 or less. However, as many clients as possible were given individual examinations.

The tests were selected from the following battery:

Intelligence tests: Wechsler-Bellevue Adult Intelligence Test, Otis Self-Administering Test (Intermediate or Higher form), Revised Army Beta, Scovill Classification Test.

Manipulative and manual dexterity tests: Minnesota Rate of Manipulation Test (Placing, Turning), O'Connor Finger Dexterity Test, Purdue Pegboard, U. S. Employment Service Finger Dexterity Test.

Mechanical aptitude tests: O'Rourke Mechanical Aptitude Test, Minnesota Spatial Relations Test, Minnesota Paper Form Board.

Clerical tests: O'Rourke Clerical Problems, O'Rourke Clerical Reasoning Test, Minnesota Vocational Test for Clerical Workers, U. S. Employment Service Clerical Test.

Personality tests: The Bell Adjustment Inventory, Freyd Occupational Interest Blank, Minnesota Multiphasic Personality Test.

The psychological examinations were done by the authors, by Dr. R. B. W. Hutt of Trinity College, and, under supervision, by graduate students in clinical psychology at Yale University. The selection of tests to be administered was prescribed on an individual basis with consideration given to medical, educational, occupational, and personal factors. It was possible on the basis of the test results to secure some measure of the individual's general intelligence, non-language and verbal abilities, manipulative ability and finger dexterity, and an indication of his aptitude for higher-order

mechanical work. Since there appeared to be a rather severe shortage of draftsmen and blue print readers, the Minnesota Paper Form Board and Minnesota Spatial Relations test were used with the younger and more alert clients in the hope that high scores on these tests would select those men who could most profitably take special war training courses in these subjects. The personality tests were given not only to obtain objective scores, but to serve as a basis for discussion of personal problems and vocational interests.

After the testing procedure had been completed, the scores were interpreted and recommendations for training or job placement were made in the light of the client's physical limitations, suitability for available jobs, his interests and his occupational history. Many recommendations included a period of training either "on-the-job" or in preparation for particular job openings. Recommendations were facilitated by use of job dictionaries, and job analysis data of various Connecticut industries made by Dr. Clyde Gleason of the U. S. Employment Service.

The following represents the status of the 222 clients who were given psychological service from March 1942 through June 1943:

Placed and working	136
Uncooperative or lost contact	20
Action pending but work plans incomplete	19
Physically unfit for work	17
No suitable job found	15
Still in training	8
Found own job	3
Appliance only	1
Institutionalized (mentally defective)	2
Not handicapped	1

The types of handicaps present in the group were as follows: leg and foot disabilities, 27.6%; arm and hand disabilities, 18.3%; tuberculosis, 17.5%; vision, 12.5%; hearing, 8.6%; cardiac, 3.5%; speech, 3.1%; epilepsy, 2.3%; miscellaneous (e.g. "nervous," circulatory, gastro-intestinal), 6.6%.

The mean age of the group was 36.5 years with a range of 17 through 82 years. The mean of the highest grade reached in school was 8.9, with a range from no schooling to college education.

The mean I.Q. of the group was 94, suggesting that these clients are fairly representative of the general population with respect to intelligence. Table I shows the mean I.Q. ratings on the various intelligence tests administered.

TABLE I

INTELLIGENCE LEVEL DETERMINED BY VARIOUS TESTS

Test	*Number Given*	*Average I.Q.*
Wechsler-Bellevue	57	96
Otis S. A.—Intermediate	48	87
Otis S. A.—Higher	18	102
Scovill Classification Test	65	97
Revised Army Beta	54	*
Henmon-Nelson	1	99
	243	94 (N = 189)

* I.Q.'s were not computed on this test.

The average I.Q. is based upon those tests in which the norms and adequacy of the tests for the individual made the computation of an I.Q. feasible.

Table II shows the median percentile ratings of the group on the other tests of the battery.

TABLE II

PERCENTILE RATINGS ON MECHANICAL, MANIPULATIVE, AND CLERICAL TESTS

Test	*Number Given*	*Median Percentile*
Minn. Paper Form Board	52	53
O'Rourke Mechanical Aptitude	89	54
Minn. Spatial Relations	82	56
Minn. Placing	198	38*
Minn. Turning	174	57
O'Connor Finger Dexterity	176	44
Minn. Clerical: Names	76	57
Minn. Clerical: Numbers	80	46
O'Rourke Clerical Problems (Junior Grade)	63	50

* It was noted that one-armed people tended to do poorly on the Minnesota Placing Test even though the test requires the use of only one arm and hand.

Although Table II indicates that the group medians tend to be within average range for the above tests, the distribution of the actual scores did not follow the normal curve. Table III illustrates the tendency of the tested group to be more heterogeneous than normal and to pile up at the extremes.

The somewhat superior scores on the Minnesota Paper Form Board, the Minnesota Spatial Relations Test, and the O'Rourke Mechanical Aptitude Test are probably due to a selective factor because these tests were usually given only to the relatively superior client.

TABLE III

DISTRIBUTION OF TEST SCORES ON MANIPULATIVE, MECHANICAL, AND CLERICAL TESTS

Test	*0–19 percentile*	*20–79 percentile*	*80–99 percentile*	*N*
Theoretical distribution	20	60	20	
Minn. Paper Form Board	23	44	33	52
O'Rourke Mechanical	16	57	27	89
Minn. Spatial Relations	29	42	29	82
Minn. Placing	33	49	18	198
Minn. Turning	25	51	24	174
O'Connor Finger Dexterity	31	50	19	176
Minn. Clerical: Names	13	63	24	76
Minn. Clerical: Numbers	12	57	31	80
O'Rourke Clerical Problems	32	43	25	63

Table IV summarizes the job placements for the cases in the group who have been placed and have been successfully working on the job for at least two months.

TABLE IV

JOB PLACEMENTS OF GROUP EXAMINED

Type of Job	*N*	*Per cent*
Machine operation	27	19.9
Clerical work (typing, accounting, time-keeping, checking, etc.)	27	19.9
Maintenance (guard, janitor, elevator operator, loading, etc.)	23	16.9
Inspection	19	14.0
Assembly	13	9.6
Executive or foreman	6	4.4
In business school	4	2.9
Drafting	2	1.5
Miscellaneous	15	11.0
	136	

For those actually employed, the mean starting wage was $31.20 a week, with a range of $15.00 to $60.00.

The validity of the recommendations made on the basis of psychological examinations has not yet been fully established. It was not always possible to place a client in a job directly related to his aptitudes as measured by test scores because of his physical limitations, unavailability of jobs, etc. Of the 136 clients examined and placed, 79 obtained positions consistent with the recommendations; 35, jobs which were related to the recommendations; and 22, jobs which were unrelated to their aptitudes as measured. The

clients furthermore had usually not been working long enough to permit a statistical follow-up of their adjustment. Of 27 clients who had been working for two months or longer to whom questionnaires were sent, 24 checked their job placement as satisfactory, 3 as fair. Employers of 23 of these workers checked the workers' progress as follows: *absenteeism:* good, 21; fair, 2; *production:* good, 17; fair, 3; *reliability:* good, 20; fair, 2. In addition, a questionnaire returned by 37 employers gave the following information concerning absenteeism, reliability, production, and proneness to injury: 69% of the ratings classified the handicapped employees as somewhat better than the able-bodied worker in the above factors; 21% stated that the handicapped were equal to or no different from the able-bodied; 10% classified handicapped persons as definitely superior to their able-bodied workers.

The following are a few spontaneous and typical comments (selected from a large number) from employers regarding their success in the utilization of handicapped workers. The president of a war plant which employs 117 handicapped workers in a total employment of 1000 states: "The percentage of lost time is much less than among our regular employees." The works manager of a plant employing 2000 workers comments: "None of the above (handicapped) lose time due to their condition and they are less apt to take a day off now and then than the normal person." The general manager of a war plant employing 5000 workers, of which 280 are handicapped, states: "The percentage of absenteeism on the part of these handicapped persons is not excessive and corresponds quite well with others not handicapped." The vice-president of one of Connecticut's oldest concerns reports. "The physically handicapped have a very good record. Their attendance in all but one case is regular and their production is entirely satisfactory both from the standpoint of quality and quantity. None of the above show unusual susceptibility to injury."

These surveys indicate that employers through the urgent necessity for manpower, have employed many handicapped workers. Many of these employers now volunteer opinions that this was good business, and that handicapped workers, if they are carefully selected and properly guided into fields in which they have comparable ability, will equal and sometimes exceed the usefulness of the able-bodied. This acceptance of the handicapped by employers was aided materially by attendance of personnel managers at Rehabilitation Clinics, where they gained at first hand familiarity

with the extensive diagnostic measures carried on by rehabilitation service.

A comparison of the success of the rehabilitation of the above clients with the results of a rather unsatisfactory recent attempt to rehabilitate for employment a group of handicapped veterans of World War I, leads to the conclusion that it is of the utmost importance to accomplish the vocational adjustment of the individual as soon as it is physically possible for him to go to work.

Twenty men were selected for study from the group at Rocky Hill Veterans Hospital, Connecticut, on the basis of interviews, past experience and interest, as most likely to profit from rehabilitation service. They were enrolled in a standard machine operation course and provided with transportation, and maintenance during training. Additional services in some cases included the provision of appliances, work tools, texts, and work clothing.

The training was a standard 200-hour course conducted for eight hours a day. Of the group, 55% completed the course at the standard rate; 20% of the group upon recommendation of the instructor were released from training before the completion of 200 hours because of superior and rapid progress (the average for this group being 117 hours' training). The remaining 25% failed to complete the course for various reasons such as "too slow," "work too complex," "physical limitations," "temperamental difficulties," "trainee impatient, wants job immediately."

Regardless of the degree of success attained during training, each client was followed closely and positive aid was given each trainee in securing a job consistent with his ability, skill, and interests. The brisk demand for trained workers made job opportunities available to 90% of the group. Of these 75% were offered jobs consistent with their training, 25% jobs not related to their training (this largely because their training was not satisfactory or incomplete). The mean wage offered was $42.00 a week.

The argument for prompt rehabilitation rather than delayed, as in the case of the group under consideration, is in the fact that only a small proportion of these men satisfactorily handled the jobs which had been obtained for them. The success of the group may be measured in terms of the following criteria: 30% have been faithful workers for three months or more, and are reported as working at this writing; 10% failed to investigate the job opportunity offered (cause usually alcoholism); 15% failed to report for work after having been told by an employer that they were hired

(usual cause alcoholism); 45% accepted work, worked successfully for varying periods of time (average one month) and then brought about the termination of their employment. The cause in these cases also was alcoholism in eight out of nine cases. The obvious difference in the success of prompt rehabilitation as contrasted with this delayed attempt at rehabilitation of World War I veterans points to the urgent need for immediate psychological study and supervision of men who will come out of the present World War as physically handicapped individuals.

Results of the above studies and the problems which have been suggested as a result of the studies indicate that there are a number of ways in which the services of a trained psychologist can be utilized in a rehabilitation program. The following are some of the functions which seem to fit the role of the psychologist:

A. Operational procedures

1. Vocational guidance based on aptitude testing.
2. Psychological counselling.
3. Supervision of training: speech correction, training in visual efficiency, training in residual hearing and in the use of artificial appliances, training in recovery of motor functions.

B. Research

1. Test construction: better validation of existing aptitude tests, construction of new tests for various occupational skills, tests adapted to various physical defects.
2. Job family analyses for physically handicapped.
3. Investigation of the most efficient conditions of work for the various types of physical disabilities. In a field where the medical man is concerned with the limitations of the types of activities in which a client can engage, where engineers are concerned with modification of the design of machines, equipment, and tools to be used by the physically disabled, there is a field of investigation open to the psychologist to study factors influencing production and job satisfaction such as frequency and length of rest periods for various disabilities, noise factors, distractions, etc.
4. Special methods of training in industry for handicapped individuals.
5. Problems of morale among the handicapped.

C. Psychological consultation.

Psychologists should be available for consultation as members of a working team which might include rehabilitation supervisors, personnel managers, and physicians, and be able as a result of their background of training to contribute ideas on questionnaire forms, problems of personnel selection, statistical evaluation of research programs and other such problems.

OCCUPATIONAL ANALYSIS ACTIVITIES IN THE WAR MANPOWER COMMISSION

CARROLL L. SHARTLE, BEATRICE J. DVORAK, AND ASSOCIATES

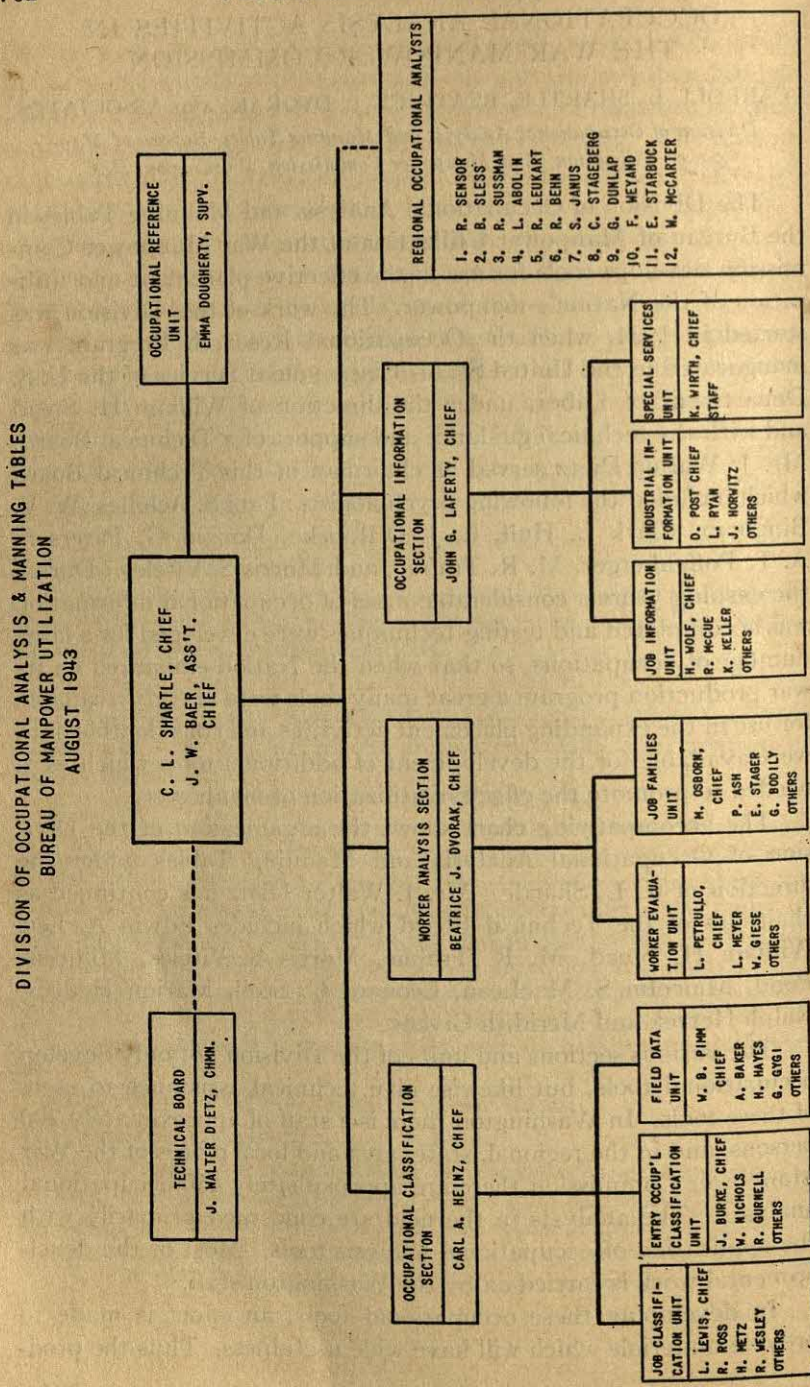
Division of Occupational Analysis and Manning Tables, Bureau of Manpower Utilization, War Manpower Commission, Washington, D. C.

The Division of Occupational Analysis and Manning Tables in the Bureau of Manpower Utilization of the War Manpower Commission develops tools for use in the effective placement and utilization of the Nation's manpower. The work of this Division was started in 1934, when the Occupational Research Program was inaugurated in the United States Employment Service of the U. S. Department of Labor, under the direction of William H. Stead and with the technical guidance and support of a Technical Board. Mr. J. Walter Dietz served as chairman of this Technical Board which included the following psychologists: Paul S. Achilles, W. V. Bingham, Clark L. Hull, L. J. O'Rourke, Donald G. Paterson, A. T. Poffenberger, M. R. Trabue, and Morris S. Viteles. During the ensuing years a considerable mass of occupational information was accumulated and testing techniques were developed for a large number of occupations, so that when the Nation embarked on its war production program a great many tools were already available for use in the expanding placement activities and considerable data were available for the development of additional tools which were needed to promote the effective utilization of manpower.

The accompanying chart shows the organization of the Division of Occupational Analysis and Manning Tables under the direction of C. L. Shartle. Mr. J. Walter Dietz has continued as chairman of the Technical Board which includes Edwin A. Lee, William H. Stead, M. R. Trabue, Morris S. Viteles, Millicent Pond, Malcolm S. MacLean, Leonard C. Stoll, Marion Hedges, Ralph Hetzel, and Meridith Givens.

The various sections and units of the Division not only develop occupational tools, but likewise give technical assistance to users of these tools. In Washington there is a staff of approximately 200 persons, and in the regional, state, area and local offices of the War Manpower Commission there are approximately 450 occupational analysts. The analysts in the field are concerned primarily with the application of occupational analysis tools. Most of the developmental work is carried on by the Washington staff.

In developing these occupational tools, an effort is made to provide materials which will have wide usefulness. Thus the prod-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ucts of the division are used not only by the offices of the War Manpower Commission but also are extensively applied by employers, unions, the Armed Forces, and by various Government agencies. Consequently the division works in very close cooperation with the users of its products, so that the materials can be effectively applied.

Thus far approximately 20,000 industrial plants and 50,000 employed workers have cooperated in the research. Seventy-five thousand jobs have been analyzed, 10,000 of which were in the Armed Forces.

Occupational Tools

Job Families. A Job Family contains lists of occupations related to a single occupation or to a limited number of selected occupations. This tool has provided considerable assistance to industry, government, the Armed Forces, and training agencies in dealing with problems of classification, selection, transfer, and upgrading.

Over 85 Job Families have been prepared showing groups of occupations related to a specific occupation. Some of these have been developed for use in selecting workers from related occupations for upgrading to an occupation in which there was a critical shortage of experienced workers; others have been prepared for use in transferring workers from occupations in which there were surpluses of unemployed workers. In addition, over 45 Job Families have been developed for entire industries. Some of these have been concerned with the conversion of workers from less-essential industries to war work, while others have been prepared to assist war industry in recruiting suitable workers and in upgrading and transferring the employees already on the job. Another series of Job Families has been developed to show the civilian occupations related to military occupations.

These materials, containing extensive information on job relationships, the basis for the relationships, and in many cases the training probably required for workers with related experience, have been distributed widely to Regional, State, and local offices of the War Manpower Commission. In local United States Employment Service offices the Job Families provide placement personnel with occupational information to assist them in finding suitable workers to fill job openings, in determining suitable job possibilities for unemployed workers, and in selecting workers for suitable war training. Regional and state occupational technicians have

used Job Families to advantage in assisting and advising industry on problems relating to manpower recruitment, allocation, and utilization. Job Family information prepared for the U. S. Army, U. S. Navy, U. S. Marines, and U. S. Coast Guard has been used by them in their classification and assignment of recruits on the basis of related civilian experience. Job Family information has also been supplied to other government agencies such as the National War Labor Board, Bureau of Labor Statistics, War Production Board, and the Office of Price Administration for their use in dealing with problems such as wage adjustment and industry curtailment and concentration. Vocational guidance agencies and training centers have also found useful information in Job Families, both for counseling and for planning the content of training courses.

The basic data from which the Job Families are developed consist of job analysis schedules and worker characteristic forms on which the job analysts indicate their estimates as to the amounts of worker traits needed for successful performance of the job. These include traits such as strength, dexterity, and memory. All available schedules and forms resulting from job analyses of the same job in various plants in different parts of the country are compared and summarized, and the information is transferred to Speed Sort cards. A card is prepared for each occupation. About 85 different items are entered on the card, including information on experience, training, industry, machines, tools, work performed, and worker characteristics required. The Speed Sort cards are punched and set up in files.

The items which are punched on the card indicate the pattern for that job and the cards are sorted to find the occupations which have the same or a similar pattern. In the development of the Job Family for Airplane Woodworker, for example, the first step involved the determination of all the requirements of that job. The relative importance of each requirement was determined by considering how large a part of the job it constituted, how important it would be in the training of a new worker, and how high a level of skill it represented. Each of the many requirements of the job, outside of specific employer requirements of age, sex, experience, etc., could be grouped into four major categories, as follows:

(1) *Nature of work done*—the basic processes involved in the work of the job; in this instance laying-out, cutting, shaping and forming, and assembling.

(2) *Significant worker characteristics required*—the pattern of worker traits required in an outstanding degree for successful job performance; in

this instance ability to plan, manual dexterity, eye-hand coordination, perception of form, and knowledge of structures and shop practices.

(3) *Machines, tools, and other work aids used*—in this instance several woodworking machines and hand tools, as well as blueprints and special measuring devices.

(4) *Material worked on*—in this instance wood.

Certain items were selected as minimum requirements. All jobs which, through sorting, were found to lack these requirements were discarded, since workers from those jobs would probably not be any better than persons selected at random to fill an opening for Airplane Woodworker. Additional sorts after this stage were made in order to place all the related occupations in their proper relationship to the Airplane Woodworker because of additional requirements held in common. The order in which each additional sort was to be made was determined from the original analysis and ranking of the requirements of the Airplane Woodworker.

Tools for Placement and Utilization of Physically Handicapped Workers. There has been an increasing need for tools to aid in the placement and utilization of physically handicapped workers—not only because of the stringencies in the labor market and the necessity for utilizing such reserve workers, but also because the Armed Services are discharging disabled personnel and it is important to return these people to civilian employment as rapidly as possible.

The technique of physical demands analysis has been developed for this purpose. The Physical Demands Form supplies a standard terminology which makes it possible to relate the physical capacities of individuals to the physical requirements of jobs. The job analyst prepares the physical demands information on jobs. From observation of the job, he determines the specific physical requirements, working conditions and hazards. The interviewer appraises the physical capacities of the applicant in the same physical demands terms, verifying such appraisal by medical reports when available. He then compares his appraisal of the applicant's physical capacities with physical demands information on specific jobs related to the applicant's experience.

Special Aids for Placement of Military Personnel. Special aids are being prepared for use in the placement of persons discharged from the Armed Forces. These contain the following information:

(1) civilian occupations related to military occupations;

(2) additional training which would be required of the Service man before placement in the related civilian occupation;

(3) physical activities and working conditions characteristic of the related civilian occupations.

A volume of special aids covering Navy occupations has already been published and is being used by personnel from local offices of the War Manpower Commission who interview men prior to their discharge from Navy hospitals and make arrangements for their placement in suitable training courses or employment. A similar volume of special aids covering Army occupations is now being prepared.

Trade Tests. Oral Trade Questions have been developed for over two hundred occupations. They are used in almost all United States Employment Service offices. In addition, close to 5000 copies of the volumes of the trade questions are used by the War Department and approximately 600 copies by the Navy Department. The U. S. Coast Guard, the U. S Marine Corps, and the War Shipping Administration also use the trade questions; and the British and Canadian Armed Forces have also been supplied with copies.

In the local Employment Service offices, trade questions are used as aids in the placement and utilization of skilled workers. In the Armed Forces they are used as aids in the occupational classification of military personnel and in the assignment of such personnel to specific occupational duties.

These trade questions are prepared as lists of questions alone and also as lists of questions which pertain to pictures. The picture trade questions may pertain to a photograph showing an operator at a machine, in which case the questions are designed to measure the worker's knowledge of how to operate the machine; or they may pertain to specific job duties such as blueprint reading or micrometer reading.

In addition to trade questions, performance trade tests have been developed for measuring typing and dictation proficiency. These are used in many offices of the War Manpower Commission in handling the placement and utilization of clerical workers..

The sets of trade questions are developed according to carefully worked out procedures which insure that the questions are pertinent to the occupation and that they differentiate between experts and other groups of workers such as apprentices, helpers, and workers in related occupations. The development of trade tests involves the following steps: (1) occupational survey; (2) collection of questions for an occupation; (3) preliminary verification of the questions; (4) final verification; and (5) final preparation of selected questions.

The occupational survey involves the securing of information

concerning the details of all knowledge and skill factors necessary for adequate performance of all duties of the occupation for which the test is to be developed. The second step involves the collection of questions concerning all the details of the job. These questions are secured from experts on the job and are worded in the language of the worker. The questions apply specifically to the knowledge and skill factors which have been determined to be pertinent to the job.

The entire list of questions is then tried out on a preliminary sample of experts in the occupation and a group of workers in closely related occupations. The object of this preliminary trial of the questions is to select a list of questions which adequately cover all phases of the occupation and which appear to differentiate roughly the experts from the non-experts. Considerations such as the ambiguity of a question, the number and types of answers given to a question, and the difficulty of the question are carefully evaluated when the set of questions is selected for further experimental trial. The final verification of the questions involves their administration to experts, apprentices and helpers, and workers in related occupations in all parts of the country. The workers' answers to the questions and their comments are recorded verbatim.

The final step involves a careful evaluation of the questions which have been administered to workers in plants throughout the country. Each question is carefully analyzed and a final set of questions is selected. Standards such as the following are used in determining which questions are to be selected for the final form of the test:

(1) the question must be specific and pertinent to the job;
(2) the question must not be ambiguous;
(3) the question must not be so difficult that many experts cannot answer it, nor so easy that many apprentices, helpers, and workers in related occupations know the answer;
(4) the question must differentiate between experts and apprentices, helpers, and workers in related occupations; and
(5) the question must not have too many answers.

In addition to the analysis of each question, statistics such as the critical ratio are employed in order to compare responses of the experts and non-experts. Norms are computed for each set of questions, and whenever there are enough questions which survive the verification, alternate forms of the test are developed.

Aptitude Tests. Aptitude-test batteries have been developed for about 170 occupations and are used in Employment Service

offices to aid interviewers in selecting the most satisfactory beginners to be referred for training on a job or in a training course. A number of our aptitude tests are also used by the War Department.

At the present time emphasis in the work on the development of aptitude-test batteries is being placed on those occupations which are important in the war effort. Batteries have been developed for occupations such as Explosive Operator, Aircraft Riveter, Arc Welder, Precision Lens Grinder, Booster Inspector, Radio Transmitter Assembler, Machinist, Sheet Metal Worker, Power Sewing Machine Operator, and Power Press Operator.

Before an aptitude study is carried out, a preliminary survey is made. Such a survey includes the making of a job analysis; estimation of the worker characteristics involved in the job; the collection of personnel information such as the number of workers employed, and the age, education, and length of experience of the workers; a determination of whether the work performed by the different workers is comparable; and a determination of possible criteria that might be used as measures of job proficiency. When this preliminary information indicates that conditions are favorable for the conduct of an aptitude study, the following steps then ensue: the selection of an adequate experimental sample of workers or trainees, the development of an adequate criterion, the administration of an experimental test battery to the workers or trainees, the statistical analysis of the data to select the best combination of tests, and the development of norms. In order to validate the battery for nation-wide use, check studies are conducted on additional samples of workers in the same occupation. After the battery has been put into use as a selection device, follow-up data are collected, when possible, to determine the effectiveness of the battery in selecting the most satisfactory beginners for referral to job openings. Some work has already been done on the development of general aptitude-test batteries, and it is planned to do more work of this type. A general battery is developed from data for several samples of workers in each of a number of related occupations and thus applies to a group or family of occupations.

Research is also being conducted on the determination of basic factors or fundamental aptitudes underlying numerous tests which have been found to have predictive value for various types of occupational proficiency; and the construction of tests which measure each of the basic factors. In constructing such tests it is planned to combine for each factor the three or four tests which

are most highly loaded with that factor. Since the tests will be designed to measure the more important human abilities involved in occupational proficiency, the results of such tests should prove of great value for occupational counseling. For this purpose it is intended to develop occupational norms by means of which each applicant's test achievements can be evaluated. A series of factor analysis studies of 54 of our aptitude tests is in progress. Some preliminary results indicate that some of the factors underlying these tests are similar to factors which have been discovered previously by Thurstone and other investigators.

Occupational Definitions and Classifications. The most widely used tool prepared by the division is the *Dictionary of Occupational Titles.* The *Dictionary* defines and classifies 21,000 separate jobs. Approximately 50,000 copies of the *Dictionary* are in use. Four thousand five hundred copies are in use by the Army, Navy, Coast Guard and Marines. Private industry is using 10,000 copies and schools and libraries 5,000 copies. The United States Employment Service uses 16,000 copies. During the past twelve months 1800 definitions have been added to the *Dictonary.* The *Dictionary* was issued originally in 1940, and in order that additions and revisions may be made a Supplement is issued approximately every six months.

Occupational Information. Occupational information is made available through the preparation of job descriptions. Job descriptions have been issued in book form for 14 industries. In recent months job descriptions for important war jobs have been issued in booklet form on an occupational basis rather than on an industrial basis. Approximately 17,000 copies of each description are prepared for distribution to the offices of the War Manpower Commission and to other Government agencies which require the information. In addition to the issuing of the regular job descriptions the Division operates a nation-wide occupational information service. This service utilizes the Occupational Reference Unit of the Division which has on file copies of 75,000 job analysis reports, several thousand plant Manning Tables, and a large amount of other data received from employers, unions, and Government agencies.

Manning Tables. A widely used tool which has been developed by the Division is the Manning Table. The Manning Table is in reality a personnel blueprint which an employer may prepare, if he wishes, as an aid to manpower utilization within his plant and as a tool for planning Selective Service withdrawals, recruiting, and

training. The Manning Table shows the classification of jobs within the plant either according to the *Dictionary of Occupational Titles* or some other standard and reveals the numbers and percentages of workers in each occupation. The Manning Table also shows the extent to which women are being utilized, the extent to which jobs are being re-engineered, and jobs in which handicapped workers are utilized; and gives a forecast of the labor requirements for the next six-months period. Manning Tables have been developed thus far by approximately 4,000 plants, and at present there are approximately 3,000 plants in the process of preparing Manning Tables. The Division, using the information derived from plant Manning Tables, prepares industry Manning Tables which reveal the occupational classifications and distributions by industrial activity and also bring out factors of utilization that are typical in the industry. Industry Manning Tables have been developed as part of manpower utilization programs in both England and Germany.

Contribution of Psychologists

While no attempt is made by the Division to label certain products and activities as in the exclusive field of the psychologist, the activities concerning Job Families, trade tests, and aptitude tests are carried on primarily by persons who have a background in psychology. In the occupational classification and occupational information activities of the Division, fewer persons with psychological training are used, but psychological training nevertheless has a contribution to make to these activities. The Division attempts to have a well integrated program which draws heavily upon the skills of persons with backgrounds in psychology, business administration, personnel administration, and engineering. Staff members trained primarily in psychology are encouraged to absorb training and to develop professional skills in the activities of the Division for which training other than psychology is a more frequent requirement. Thus, while there are a number of specialists, emphasis is placed upon the development of personnel who are well rounded in the program.

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27. Occupations Related to Electric-Arc-Furnace Operator, Job Family Series No. O-38 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
28. Occupations Related to Engine-Lathe Operator I, Job Family Series No. O-3 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
29. Occupations Related to Occupations in General Woodworking, Job Family Series No. I-24 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
30. Occupations Related to Occupations in the Manufacture of Glue and Gelatin, Job Family Series I-46 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
31. Occupations Related to Heat Treater, All-Round, Job Family Series No. O-37 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
32. Occupations Related to Occupations in the Manufacture of Jewelry, Job Family Series No. I-44 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
33. Occupations Related to Occupations in the Locomotive and Car Building and Repairing Industry, Job Family Series No. I-49 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
34. Occupations Related to Occupations in the Logging and Sawmill Industries, Job Family Series No. I-45 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
35. Occupations Related to Mechanical Draftsmen, Job Family Series No. O-23, (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
36. Occupations Related to Patternmaker, Wood, Job Family Series No. O-13 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
37. Occupations Related to Occupations in Printing and Publishing, Job Family Series No. I-22 (War Manpower Commission, U. S. Govt. Printing Office Washington, D. C., 1943).
38. Occupations Related to Occupations in the Quarrying Industry, Job Family Series No. I-10 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).
39. Occupations Related to Occupations in the Manufacture of Refrigerators and

Refrigerating and Ice-making Equipment, Job Family Series No. I-5 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).

40. Occupations Related to Screw-Machine Operator, Automatic, Job Family Series No. O-31 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).

41 Occupations Related to Stonemason, Job Family Series No. O-28 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).

42. Occupations Related to Basic Occupations in Synthetic Rubber Monomer Production, Job Family Series No. O-84 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).

43. Occupations Related to Structural and Ornamental Metal Work, Job Family Series No. I-30 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).

44. Occupations Related to Occupations in Wooden Box Manufacture, Job Family Series No. I-39 (War Manpower Commission, U. S. Govt. Printing Office, Washington, D. C., 1943).

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THE USE OF JOB FAMILIES FOR THE PHYSICALLY HANDICAPPED

CLYDE W. GLEASON, *Occupational Technician, U. S. Employment Service, Hartford, Connecticut*

Until recently the occupational counseling of the physically handicapped has not utilized scientific psychology in anything like a comprehensive or systematic fashion, and the result was that such counsel was safely negative rather than hazardously positive. It cannot reasonably be expected of a physician who is not an occupational specialist, that he should tell his patient what he might do for a living, though he may be very explicit in telling him what he must not do. At best, the doctor can put his negative advice in positive language only in some such way as this: You must do light work; it must let you sit down most of the time; it must not be night work; it must not be competitive or at high speed; you must be able to forget it at closing-time. There is the prescription, and someone who knows the specific characteristics of the job opportunities within the patient's range must help him fill it. Obviously that person must be a job analyst or have direct access to the results of job analysis. Obviously, too, he must be capable of assaying the individual's potentialities, developed skills which might be salvaged, and other limitations which might restrict the range of work beyond those imposed by the physical disability itself.

The reason why really good occupational counselors are so scarce is because they must be skilled and experienced in both of these historically separate fields. It ordinarily takes one kind of psychologist to feel at home in industry, to talk the language of the foreman, to know hundreds of jobs in name and in fact, and their variations from plant to plant, and to know, first-hand, the tasks of the farm, the office, the merchandising establishment and the great miscellany of personal, technical and professional services. It takes another type of psychologist to know the clinic and its instrumentalities, and to know how to understand and to adapt his methods to the infinitely varied forms of physical disability.

It is apparent that the problem of vocational rehabilitation of hundreds of thousands of disabled veterans and casualties of war industry calls for wholesale methods, quickly applied. There will not be time to provide adequate training to novitiates in any combination of these two broad and complex fields. There may, how-

ever, be time to give those who are now masters of one field, specific training and useful tools to offset their deficiencies in the other. It may be possible to help occupational analysts, industrial engineers, employment interviewers and others who are close to industry, to acquire some of the complementary clinical knowledge and understanding that they will need if they are to be useful in this new task. On the other hand, it may be practicable to provide clinical psychologists, psychiatric social workers and educational guidance people with concentrates of job information which have been designed and developed by occupational specialists for the purpose.

In the preceding article (Shartle et al) the development and construction of such occupational tools has been described. All of them, including Job Families, physical demands analyses, trade tests, aptitude tests, and occupational information, are necessary, for the vocational counseling of the physically handicapped. The present paper deals chiefly with the utilization of Job Families.

Job Families for the physically handicapped have been developed in response to a need for more specific knowledge of the full range of tasks which each major type of physically impaired person might fittingly perform. Like other Job Families, the series for the handicapped vary in type to meet specific needs. One of them, for example, is entitled "Arc Welder and Related Occupations Suitable for Individuals with Loss or Complete Disability of One Hand." The wartime demand for workers in this area has been particularly heavy, and analysis has revealed that in twenty-one industries a total of forty-two occupations related closely to arc welding can be manned successfully by persons with that disability. Surveys of people actually so employed confirm the analysis. In this, as in all Job Families, a standard title and classification number for each listed occupation are means of reference to definitions in the Dictionary of Occupational Titles, to Job Descriptions which supplement the definitions by detailed statements covering significant phases of the job, special mental and experience requirements, analyses of normal physical demands, requisite training, etc., and to trade questions, aptitude tests, and other aids.

Another and more common type of Family covers all of the usual occupations in a given industry, and provides, for each, "a recommendation as to its probable suitability for the employment of individuals with any one of eleven types of physical impairment." A foreword states that " . . . each suggestion is based on

a careful comparison of the average limitations the disability imposes upon a person, with the typical physical demands and requirements of the occupation. . . ." The user is cautioned that not all recommendations have been validated; that not all people can succeed in work recommended for their type, and that one must be on guard against atypical working conditions.

The eleven types of disability which are treated in this series are listed below. Each is identified in Family listings by the letter symbol which precedes it.

A Loss of one thumb and one finger of either hand
B Loss or complete impairment of one hand or arm
C Fallen arches and flat feet, or varicose veins
D Leg disabilities—lame with severe limp, or one leg amputated above the knee, or cases in which crutches are used
E Hernias
F Severe back or spinal injuries
G Gastric ulcers or abdominal adhesions
H Heart disease (minor cardiac ailments)
J Inactive pulmonary tuberculosis, asthma, or chronic bronchitis
K Defective vision (not total blindness)
L Deaf-mutism

For each disability type there is a summary of "the various factors which have been considered in recommending jobs as suitable or unsuitable. . . ." The following statement concerning heart disease is illustrative:

Occupations requiring more than average strength, exertion, or endurance, or in which emotional strain is likely to develop, are not considered suitable for individuals with heart disease even of the minor types permitting normal or but slightly diminished activity. This includes activities such as heavy lifting, pushing, or pulling, or quick movements such as may occur in climbing, crawling, running, walking, stooping, or bending which may prove injurious to these persons. Since cardiac cases must also avoid worry, anxiety, and irritation such as may arise in hazardous or unpleasant conditions of work, and in addition, must not be subjected to marked changes or extremes in temperature, pressure or humidity, occupations involving either are regarded as unsuitable.

Several Families of this type have been made available for the use of local Employment Services. These particular Families contain recommendations for all of the principal occupations in each of the following manufacturing industries: ammunition and explosives, firearms, tanks, gun sights and bomb sights, ordnance, aircraft, airplane engines, ship, boat and submarine building, air

transportation and aircraft maintenance, military and naval construction and petroleum refining.

The Aircraft Family is representative. Three hundred seventy-five occupations, ranging from professional to unskilled levels, are treated as shown in the following segment:

Occupational Code	Title	DISABILITY										
		A	B	C	D	E	F	G	H	J	K	L
6-94.233	Circle-Shear Operator II	X	0	0	0	X	0	0	0	0	0	X
6-94.234	Crowning-Machine Operator	X	0	0	0	X	0	X	0	0	0	X
6-94.240	Bending-Machine Operator, Pneumatic	X	0	0	0	X	0	0	0	0	0	X
6-95.001	Solderer I	X	0	X	X	X	X	0	X	X	0	X
6-95.053	Tube-Bending-Machine Operator I	X	0	0	0	0	0	0	0	0	0	X

In the code numbers shown above, the "6" indicates that the occupations listed are semi-skilled. "94" is the code for sheet metal occupations, and "95" for a miscellany of inter-industry metalworking occupations. The three final digits in each number place the occupation in industry or area sub-groupings. An "X" in a given column indicates that the occupation is probably suitable for individuals having the type of disability denoted by the letter symbol at the head of the column.

Reference to the Dictionary of Occupational Titles would reveal that in the first occupation in the above segment, Circle-Shear Operator II, the worker " . . . cuts out blanks from sheet metal of light gage, according to markings, for fabrication into engine exhaust stacks, pipes and other airplane parts, using a circle-shear machine: lifts sheet metal into position level with circular cutters of machine; starts machine and guides sheet metal into cutters along lay-out markings . . . . " The "X's" indicate that this work might be done by individuals (otherwise qualified), who suffer (A) loss of one thumb and one finger of either hand, (E) hernia, or (L) deaf-mutism; but should not usually be attempted by people with any of the remaining eight disabilities. Solderer I, to take another example, is one who " . . . joins metal parts . . . by melting and applying solder . . . along edges to be joined . . . or between surfaces with flux . . . . " This job is more tolerant of physical handicap, and can be performed by otherwise qualified persons in eight of the eleven specified disability types, but should not normally be attempted by persons who suffer (B) loss or complete impairment of one hand or arm; (G) gastric ulcers or abdominal adhesions, or (K) defective vision.

Uses of Job Families for the Handicapped. There are two ways to use this type of Family:

(1) If one must find suitable employment for a person with one (or more) of the eleven types of disability, one can first collect the available Families for the industries which are within his geographical employment range, trace through the column (or columns) covering his disability, and check all items which seem to be reasonably within his range of aptitudes and interests; then

continue the process of elimination by exploring existing openings for those occupations and matching the individual to the job.

(2) If one must recommend people with physical disabilities for given job openings, one can first identify the opening with a job family listing (and this means a careful comparison, not of names and titles, but statements of duties and minimal qualifications); then note the one or more types of handicap, if any, to which the job is tolerant; check the clientele for those individuals who have those disabilities and explore their other qualifications until suitable candidates are found.

ABEL, THEODORE M. & KINDER, ELAINE F. The subnormal adolescent girl. New York: Columbia University Press, 1942. Pp. xii+215.

Two distinguished research psychologists, both of whom have also had long practical experience in utilizing the fruits of psychological research in guidance of other people, have combined in the writing of this book It may well stand as a sample of the kind of insights expected from the capable clinical psychologist of the future. The authors have drawn sufficiently heavily upon research investigations on the nature of feeblemindedness that the book has considerable scientific merit; at the same time the minutiae of research findings are definitely subordinated to the behavioral consequences entailed by the attempts of the subnormal girl to make her way in a world which is far from being geared to her understanding. While subnormal girls of age fourteen to nineteen are not cut all from one pattern, they still have many problems in common. It is these problems, and the individual ways which the girls have of meeting them, which make up the bulk of contents of this book. It is a very real and lifelike description of the techniques of adjustment which are tried by the subnormal adolescent and the ways in which these techniques work for or against her.

The limitations of age range (14 to 19 years) and of intelligence level (the range 50 to 89 IQ) work out well for purposes of keeping the subject matter of reasonable proportions. Girls of this age are at adolescence, the period of transition from childhood to adult status. Yet the high grade subnormal girls described here are not prepared at this age to get along without adult guidance to the same extent as girls of more average intelligence. They wish to follow the course of most young women of our culture, to finish school, obtain a relatively pleasant job which they can hold without too much yelling from the boss, and later to marry. Yet by the time of adolescence, Drs. Abel and Kinder think, nearly all subnormal girls are aware that they are in some way atypical. And, as the authors truly observe: "If there is one thing that any adolescent girl is sensitive about, it is to be treated as atypical." The subnormal child has, with his limited learning ability, not only to learn the ways of the world as does the normal child, but he must also have by adolescence a pretty fair idea of what his role is and where he can best enter a competition which is nearly always to the swiftest. Upon him who has not is thus deposited a double learning problem, and it is no surprise that many are not able to master the problem without considerable help.

Throughout the authors' copiously illustrated discussion of the problems of the subnormal girl in her home, at school, in industry, and in an institution are scattered many gems of case material and clinical wisdom. Clearly described, for example, is the way in which the rigidity and desire for conformity of the subnormal girl may be capitalized on in a job. The usually less strained adjustment of a subnormal girl to her far from brilliant family, as compared to the difficult time had by a girl of similar mental level in adjusting to a family with obvious intellect and high vocational standards, is a point too often forgotten when IQ's are compared

in a vacuum, as it were, without consideration of group standards other than general population norms. The "cultural trap," present in every school system, which aims to have every child reach a given hypothetical level of intellectual achievement and the obvious effects of this trap on the subnormal are here examined in a fresh and revealing way. The importance of protection and guidance of the subnormal in her initial adjustments to industry is especially well brought out. Perhaps the best part of the book is that dealing with the problems of job satisfaction for these girls, a field in which the authors have had much practical experience. These are brief samples of the rich background and flexible approach which will make this book highly useful to clinical psychologists and psychiatrists and especially valuable for recommendation to those who deal with subnormals from a slightly different point of view: social workers, teachers, visiting nurses, probation officers, judges and industrial personnel officers.

The last three chapters are concerned with more general material: the seriously maladjusted girl, community handling of subnormality, and a discussion of origins and control of intelligence defects. These round out a serious compilation of factors influencing the lives of adolescent girls of less than average intelligence. Most important for the future of clinical psychology, however, is the fact that the authors have been able to present, clearly and without undue academics, a useful and penetrating guide for those who attempt to aid such girls in making their lives more tolerable.

PAULINE SNEDDEN SEARS.

Iowa Child Welfare Research Station.

NAGGE, JOSEPH W. Psychology of the child. New York: Ronald Press, 1942. xvi+530.

In the preface of this new book on child psychology the author states that in order to include a "representative survey" of available material no attempt has been made to present a systematic point of view. Dr. Nagge has indeed presented more material than is often found in a text of this nature, but has sacrificed the interest which is derived from the inclusion of the author's own philosophy. In thus presenting much experimental material to the relatively inexperienced student the author has made a welcome departure from usual practice. Many texts on child psychology are so padded or diluted that they encourage a superficial attitude toward the field. Especially complete and well handled are the chapters on history, perception and motivation.

In general, the presentation of experimental evidence is clear and remarkably free from error, although in some instances Dr. Nagge has fallen into the error of too brief and over-simplified treatment of controversial issues. For example, this reviewer questions the wisdom of the inclusion of the chapter on exceptional children which is particularly brief and incomplete. These pages might well have been devoted to a fuller discussion of some of the aspects of normal child development, which would make for better integration of the book as a whole.

The usual topics found under mental and physical growth are treated in detail. Only one chapter, however, is included on social development and personality, and only a few scattered pages are devoted to children's emotions. No doubt this is a deliberate telescoping of the last mentioned aspects of child development in order to give an adequate treatment to the former. Perhaps the time has come when it is no longer possible to give detailed and complete consideration to all aspects of child psychology in one volume.

The chapters on play and mental and physical hygiene should be helpful to parents and teachers. There is relatively little use of illustrative material applying general principles to individual children. Those who are more interested in theory than in practice will not find this a defect. On the other hand, those teachers who feel that the more practical aspects of child care and training should be stressed, and that more emphasis should be placed on social, emotional, and personality development, will perhaps devote a greater proportion of class time to their discussion when using this book as a text, or require additional readings in these areas. The bibliographies are extensive and carefully selected, and make the book valuable as a reference source.

KATHARINE M. MAURER.

University of Minnesota.

SUPER, DONALD E. The dynamics of vocational adjustment. New York: Harper, 1942. Pp. xiii+286.

This book undertakes to set forth the principles of vocational guidance "from the point of view of the needs to be met and of the task to be performed." It is presumably a text for a beginning course in guidance, and makes no attempt to deal intensively with technical phases of measurement, clinical work, follow-up procedures, or occupational analysis and information. Concepts of vocational guidance are first reviewed against a background of social, economic, and attitudinal aspects in American occupational trends and traditions. Then the personal characteristics and economic factors basic to vocational adjustment are discussed. Methods of choosing jobs and preparing for them are briefly described. The problems of transition from school to work, adjustment on the job, use of leisure time, and unemployment are treated in separate chapters. A final chapter is devoted to the organization and administration of vocational guidance. The author believes that this method of treatment is not solely "from the point of view of the counselor, teacher, or administrator"; it is used as a more functional approach to his topic.

Dr. Super's material is best documented and most penetrating in the second and sixth chapters, wherein he deals with the gradual economic and occupational stratification of our society on the one hand, and, on the other hand, the "hitch-your-wagon-to-a-star" philosophy which young people tend to assimilate from adults and our educational system. The resultant conflict and frustration among individual youth at the "gaps between aspiration and achievement" demand rigorous modification of "education and public opinion—to develop more enlightened attitudes."

The chapter on intelligence and education in vocational adjustment is also well-documented and concise. But other parts of the book are not up to the standard of these three chapters. This may be due in part to the author's attempt to exclude from the text for an introductory course detailed treatment of measurement and clinical procedures, for example, yet to include enough of the literature on these topics to indicate their importance. The result is a relatively superficial treatment of aptitudes, personality, interests, and attitudes, both as psychological factors and as measurable aspects of job adjustment. This is followed by an extremely restricted discussion of vocational prediction versus vocational counseling, which tends to negate the value of legitimate correlational studies in favor of continuous guidance interviewing through a step-by-step process of growth. While one may well agree with the continuity of the process of guidance, the process still rests in part on theories of prediction and organization of behavior which need documentation, even for the beginning student.

A similar difficulty is encountered in the chapter dealing with adjustment on the job. Here the complex personality interplays and deviations which may result in maladjustment are reduced to a few broad situational diagnostic categories and a few general therapeutic methods. The end-result of the author's treatment is to oversimplify the problems of vocational guidance without pointing out its technical foundations and operational difficulties.

There is, unfortunately, some internal evidence of hasty writing and organization, which detracts from the book's general merit. Within the chapters, bibliographical numbers occasionally either do not key with their citations at the end of each chapter or refer to an incorrect reference by the author cited (see pages 126, 139, 166). Contradictory or confused statements appear; for example, clerical aptitude is cited as "of little importance elsewhere" (68) and as "of some value . . . in selecting certain types of mechanical workers . . . " (70). Again, the school is listed as the key agency for vocational guidance, (40) yet later, social agencies, during the 1930's, "seemed to be in the key situation for vocational guidance" (260). The selected bibliographies for each chapter frequently list several identical references, giving some evidence of the diffusion and repetition in chapter organization.

In general summary it is fair to say that the author has outlined all phases in the total function of vocational guidance, as he set out to do. In the reviewer's judgment, certain phases have been treated in a superficial manner, even beyond the limitations of an introductory text. Furthermore, there is a very real question whether *vocational* guidance, as one phase of guidance and personnel work, should be dissociated in an introductory course from the total field of which it is a part. If not, then Super's book must be supplemented by other texts. If so, then Super's book, on its own merits, is probably not up to the standard of other texts, such as Myers' *Principles and Techniques of Vocational Guidance.*

JOHN G. DARLEY.

University of Minnesota.

NOTES AND NEWS

James MacKeen Cattell Grants-in-Aid of Research. The following James McKeen Cattell Grants-in-Aid of Research for 1943–1944 in Applied Psychology have been awarded by The Psychological Corporation, 522 Fifth Avenue, New York, N. Y.: RUTH MILLBURN CLARK, Univ. of So. Calif., A method of administering and evaluating the thematic apperception test in group situations; LOUISE T. GROSSNICKLE, Univ. of Chicago, A factorial analysis of the Merrill Palmer Preschool test on two age groups, 31–33 and 49–51 months; ELSIE MURRAY, Cornell University, Variation in hue sensitivity in normal and aberrant cases: Test devices; HELEN NAHM, Univ. of Minnesota, Evaluation of some of the outcomes of the nursing school curriculum; MAURICE E. ODOROFF, Univ. of Minnesota, A genetic analysis of reactions of delinquent and non-delinquent boys to words included in certain tests of emotional development; SUZANNE K. REICHARD, Columbia University, The age factor in the development of specific mental abilities; HAROLD F. ROTH, Univ. of Minnesota, An analysis of production records in a selected manual operation; BABETTE F. SAMELSON, Radcliffe College, The relationship between race prejudice and insecurity; HELEN D. SARGENT, Northwestern University, An application of projective principles to a paper and pencil personality test. The James McKeen Cattell Grants-in-Aid Committee consists of ROSE G. ANDERSON, GEORGE K. BENNETT, HARRY D. KITSON, A. T. POFFENBERGER, ALBERT D. FREIBERG, *Secretary*, WALTER R. MILES, *Chairman*.

The Baly Medal of the Royal College of Physicians, London, has been awarded to F. C. BARTLETT, professor of experimental psychology at the University of Cambridge, for his work in the science of physiology and in particular for his contributions to experimental psychology.

The Junior College Journal, the official journal of the American Association of Junior Colleges, is publishing an extensive series of articles on the relations of Psychology to the War in its current issues. LOUISE OMWAKE is chairman of the Special Committee on Psychology of the American Association of Junior Colleges.

J. W. L. JONES, professor of psychology, Heidelberg College, has been retired after forty-one years of service.

THOMAS A. LEWIS, professor of psychology, Denison University (Granville, Ohio), has retired after twenty-nine years of service. LYNDE C. STECKLE, assistant professor of psychology, succeeded Dr. Lewis as head of the department. Dr. Lewis plans to devote much of his time to writing but will teach one course during the coming academic year.

DOUGLAS PARRY, clinical psychologist at Syracuse University, has been appointed clinical psychologist in the Bureau of Child Guidance at the Southern Illinois Normal University at Carbondale.

M. DUANE BOWN, has recently been promoted to an assistant professorship of psychology at Whitman College (Walla Walla, Wash.).

ELISABETH BELL, has been made a part-time instructor in psychology at Park College (Parkville, Mo.).

DAVID P. BODER of the Illinois Institute of Technology has been acting during the past year as Psychological Consultant to the U. S. Army

Signal Corps Training Program at I.I.T. His book "The I.I.T. Morse Code Training Forms: A Method of Learning by Anticipated Recognition," is just off the press.

GEORGE E. HILL, dean, Morningside College (Sioux City, Iowa), has been appointed director of student personnel and associate professor of education and psychology, Macalester College, St. Paul, Minn.

A program of scientific research to develop tests for measuring the intellectual and performance capacities of spastic children will be undertaken by the University of Southern California as the result of an initial endowment of $5000 made recently by the Crippled Children's Society of Los Angeles County and the California State Society for Crippled Children. This program will be supported over a period of five years. Volunteer public and professional organizations, as well as individuals dealing with spastic children will have access to the psychometric clinic which is a unit of the psychology department at the University of Southern California.

The Business Office of the American Psychological Association Publications has a number of copies of the Edgerton-Paterson "Tables of Standard Errors and Probable Errors of Percentages for Varying Numbers of Cases" printed on large sheets of paper. Copies will be sent to anyone who desires them, as long as the supply lasts, upon receipt of 10 cents to cover mailing and handling charges. Address W. L. VALENTINE, Business Manager, APA Publications, Northwestern University, Evanston, Ill.

NOTICE

In recent months the direct commissioning of men in the Army or Navy has been drastically curtailed, and there is almost no opportunity for psychologists except through regular induction channels. The Services, however, still provide many opportunities for the assignment of men and women to psychological duties after the completion of basic training. The Office of Psychological Personnel can assist in such assignments by forwarding information about psychologists to the appropriate officers in the several divisions of the Army and Navy.

Qualified psychologists who expect to be inducted are, therefore, asked to register with the *Office of Psychological Personnel, 2101 Constitution Avenue, Washington 25, D. C.*, on forms which are provided by the Office. They should later notify the Office as soon as they are inducted, giving their serial number and branch of service.

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Psychological Bulletin

ON THE PROPORTIONAL CONTRIBUTIONS OF DIFFERENCES IN NATURE AND IN NURTURE TO DIFFERENCES IN INTELLIGENCE*

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I

Edward L. Thorndike (34) once wrote that in one sense nothing in human nature is due either to heredity or to environment.

> But in another sense the most fundamental question for human education asks precisely that we assign separate shares in the causation of human behavior to man's original nature on the one hand and his environment or nurture on the other. In this sense we neglect, or take for granted, the cooperating action of one of the two divisions in order to think more successfully and conveniently of the action of the other. . . . The custom of thus abstracting out the original nature of man in independence of any and all influences upon it is so general and so useful that it is best to follow it throughout.

Similar programmatic statements have been made from time to time subsequently. An ambitious restatement is that of Shuttleworth (30), who begins his discussion of the nature-nurture problem with the question, "What promises to be the most strategic method or methods of improving the health, intelligence, and general well-being of mankind over the next fifty years?" He feels that a related but more immediate question is, "What are the relative contributions of hereditary differences and of environmental differences in accounting for individual differences in respect to each significant human variable?" Shuttleworth plainly means that percentage values are to be assigned to the contributions of heredity and environment.

A considerable number of the most important investigations

* This manuscript has been read and criticized by Dr. Barbara S. Burks, Dr. Herbert S. Conrad, and especially Professor Harold E. Jones. The writer wishes to thank them for many suggestions, though not all of the suggestions were accepted. Professor Robert S. Woodworth was kind enough to supply material which he had not included in his monograph.

in the field of individual differences have been oriented towards the discovery of the numerical value of the contributions of differences in heredity and differences in environment to differences in intelligence for a specified population. The purposes of the present paper are to review briefly these studies and the major criticisms of them, to add a critique of an assumption common to all of the studies, and to evaluate the problem to which they are directed.

II

In his 1905 monograph on twins, Thorndike (33) claims to present

> the results of precise measurements of fifty pairs of twins from 9 to 15 years old in six mental traits and their bearing upon the comparative importance of heredity and environment as causes of human difference in intellectual achievement. They will be found to give well-nigh conclusive evidence that the mental likenesses found in the case of twins and the differences found in the case of non-fraternal pairs, when the individuals compared belong to the same age, locality and educational system, are due, to at least nine tenths of their amount, to original nature.

The combination of correlational methods and intuitive judgment which Thorndike used has not played an important part in subsequent approaches to the problem. And it is not surprising that the following thirty-five years, which saw so elaborate a development of mental measurement and statistical analysis, have changed our conception of "well-nigh conclusive evidence."

A second attempt to quantify the components of mental test scores was Burt's (6) famous, ill-fated regression equation. Burt assumed that mental age on the Binet-Simon scale (B) could be expressed as a linear combination of educational age (S), intellectual development in terms of years (I), and chronological age (A). From his data on the correlation of these factors he derived the following regression equation:

$$B = .54S + .33I + .11A$$

Burt's interpretation of the regression coefficients as representing proportional contributions of school experience, native endowment, and chronological age to mental test score was challenged by Holzinger and Freeman (15). They point out that he assumed (a) that his tests were pure tests of what they proposed to measure and (b) that what they measured was a direct cause of mental age. In order to show that Burt's interpretation was not legitimate without such assumptions, they computed the regression of chronologi-

cal age on the other variables, and showed that, by Burt's method, one would be led to conclude that half of chronological age was attributable to school attainment. Correlation is not a direct measure of causal relationship because the association may be due to unmeasured variables causally related to both the correlated variables.

Although he was concerned with physical rather than mental traits, an early paper by Fisher (9) is of interest because he introduced methods which have been used subsequently with some modifications. He utilized the correlations between relatives (parent-child, siblings, etc.) to "calculate the numerical influence . . . of the total genetic and non-genetic causes of variability."

In order to perform the calculations, he assumed cumulative (i.e., additive) Mendelian factors as causes of the traits studied, and he assumed that environment, whose effect is added to that of heredity, always works in a random fashion, thus always reducing the correlations. Of importance is Fisher's use of a ratio of variances to describe proportional contributions. The proportional contributions of a factor A to the variance of a trait B is the ratio of the variance of B when factors other than A are held constant to the total variance of B. Using obtained correlations for stature, Fisher found that the variance could be apportioned into 54 per cent due to the variance of ancestry, 46 per cent due to the variance of a sibship, or it could be apportioned into 83 per cent due to the variation in genotype and 17 per cent due to the association of factors by homogamy. Admitting the possibility of sampling errors in the original correlation coefficients, he concluded that "it is very unlikely that so much as 5 per cent of the total variance is due to causes not heritable."

Burks (1) has criticized the assumption that the effects of environment are random, especially in application to intelligence. Hogben (12) has insisted that the assumption applies neither to physical nor to other characteristics: "The viviparous habit of the human species, the existence of the family as a social institution, the stratification of human society in widely different social levels all conspire to create a framework of environment which is intimately related to the distribution of genetic differences."

Willoughby (38) gave 11 standard group intelligence and achievement tests to parents and children of 141 families living in the vicinity of Palo Alto. The average of the parent-child correlations, corrected for attenuation, was .35; the average of the corrected sibling correlations was .42; the average corrected husband-wife correlation was .44. Using the formula derived by Fisher, Willoughby computed the contribution of environment to these

mental test abilities to be 46 per cent, that is, the variability in mental test abilities is almost twice as great granted the existing differences in environment than would be expected if the only differences were in heredity. The straightforward averaging of coefficients of correlation differing rather widely in magnitude is highly questionable; and Willoughby apparently did not anticipate the criticisms of Fisher's formula which Burks and Hogben made subsequently.

Another study of physical traits, of interest because it utilized correlations from different kinds of twins, is that of Dahlberg (7). He reasoned that differences found in repeated measurement of the same person are due to errors of measurement; differences between monozygotic twins are due to errors of measurement plus the variance due to differences in environment; differences between same-sexed dizygotic twins are due to errors of measurement plus variance due to environment plus variance due to differences in heredity; and differences between opposite-sexed dizygotic twins are due to errors of measurement plus environment plus heredity plus sex factors. On the basis of an additive assumption concerning the contributions of these separate factors he thus was able to estimate the variability of the separate factors, error, environment, heredity, and sex. Unlike other investigators, Dahlberg expressed the variances of the factors as percentages of the original measurements rather than as percentages of the original trait variance. The procedure is a legitimate one because of the obviousness of the absolute zero for physical measures.

Unique for the fact that it does not make use of the coefficients of resemblance for relatives is the study of Kelley (16). He assumed that the deviation score of an individual on a given trait could be expressed as the sum of his deviation scores in a nature factor and a nurture factor.

The two were differentiated by means of the supposition that the deviation from the age norm for the nature factor remains constant, while the nurture factor is weighted proportionally to the time through which it has acted on a growing ability. Recognizing the importance of the unit of measurement in assigning proportional values, he substituted "sensed differences" for the original score units. While standard deviation scores for all traits would have a variance of unity, when the "sensed difference" deviations are expressed in terms of the standard deviations, the variabilities of the traits will differ, and it is these variabilities from which Kelley obtained the degree of "idiosyncrasy" for any trait relative to any other trait. By comparing average groups of different ages, during which time the traits studied were supposed to be developing, the rela-

tive contributions of nature and nurture to the idiosyncrasy of a pair of traits was determined, and it was also determined whether environment exerted a leveling or a differentiating effect during the period studied.

Despite the elaborate conclusions arrived at on this basis, the study has not often been quoted in subsequent papers in this field. Perhaps its most serious weaknesses are the use of the unconvincing "sensed difference" units, the assumption of a constant nature factor, and the assumption, criticized by Burks (1), that the effect of environment increases directly with time.

The bulk of the discussion of the relative effects of nature and nurture on intelligence has centered around the data from studies of foster children and twins. Each type of study has claimed to achieve some degree of experimental isolation of heredity and environment. If the placement of children in foster homes of different quality is random with respect to the intelligence of the children, then the correlation between child's IQ and quality of home or foster parents' IQ is said to be due entirely to environmental influences on mental growth, insofar as the IQ test measures mental growth. Correlation between child's IQ and home factors for children raised in their own parents' home is said to be due to the influence of environment plus the influence of the inheritance of factors determining intelligence. The logic of twin studies is similar, as shown above for the data of Dahlberg. An additional type of twin comparison has been introduced, namely, a comparison of the resemblance of identical twins reared together, in which case the environments are closely similar, with the resemblance of identical twins reared apart, in environments of varying degrees of dissimilarity. Criticisms of the effectiveness of the experimental isolation of hereditary and environmental factors will be referred to but not repeated in detail, since the present review concerns rather the statistical methodology.

Probably the most often quoted percentages for hereditary and environmental contributions to intellectual variation are those of the California research of Burks (2), based on a comparison of foster children-environmental correlations with coefficients from a carefully matched control group of children raised in their own homes.

From nine separate measures of the intellectual value of the home environment, Burks selected those which would give approximately a maximal prediction of child's IQ in the foster and control groups. For 164 foster children, the multiple correlation was .35 between their IQ's and the best prediction on the basis of father's mental age, father's vocabu-

lary, mother's vocabulary, and family income. For the 95 control children, the multiple correlation was .53 between child's IQ and father's mental age, father's vocabulary, mother's mental age, and the Whittier Scale for Home Grading. Corrected for attenuation, these coefficients become .42 and .61.

Burks writes that "the multiple correlation corrected for attenuation (.42) is a measure in the Foster Group of the effect of home environment upon differences in children's intelligence. More precisely, the *square* of this multiple (.17) represents the portion of the variance of children in ordinary communities that is due to home environment." "In the Control Group, the square (.37) of the multiple correlation corrected for attenutation (.61) represents the *combined* effect of home environment and parental mental level upon the variance of children's intelligence." What of the 63 per cent of IQ variance not accounted for by home environment or parental IQ? The constancy of the IQ and the identity of identical twins argue against Fisher's suggestion that the remaining variance can be attributed to "random somatic effects of the environment." Because only one-half of the chromosomes of each parent are present in any offspring, Burks points out, the correlation with parental intelligence underestimates the correlation with hereditary determiners; she concludes that "probably the major share of the residual variance is due to congenital endowment." Thus, "close to 75 or 80 per cent of IQ variance is due to innate and heritable causes."

In a further analysis of the control group data, Burks utilized Wright's (**40, 41**) method of path coefficients.

The method of path coefficients assumes that a given variable considered as an effect is equal to the weighted sum of a set of other variables, considered as causes. On the basis of correlation between the effect, such causes as are accessible, and other related factors, the weights, known as path coefficients, are discovered. The squares of these weights are interpreted as the proportional contributions of the given causes to the variance of the effect. For "own" children, Burks set up child's IQ as the effect, with mid-parent intelligence and environment as measured by the Whittier index as causes.

She found that parental intelligence contributed 33 per cent of the variance in child's IQ, environment other than parental intelligence contributed less than one per cent, and the joint contribution of parental and environmental factors was three per cent. The sum of these percentages yields the square of the multiple correlation between child's IQ and the sum of parental intelligence

and environment as measured by the Whittier index. In this case, children raised in their own home, the contribution of parental intelligence occurs via both heredity and environment.

Wright (43) has criticized Burks' analysis of the causal relations, suggesting as a simple alternative that child's IQ is caused by heredity and environment, with parents' intelligence appearing as a variable correlated with the three other variables in the control group, but uncorrelated with heredity in the foster group. Correlations with parents' intelligence are used to solve for the unknown correlations with the postulated "heredity" factor. Solving the equations derived from this analysis of the causal relations, it is found that among the foster children home environment contributes nine per cent of the variance in intelligence, and the residual 91 per cent of the variance is assumed to be mostly hereditary. With the additional assumption that the ratio of the path coefficient of heredity to that of environment is the same for foster and own children, it is found that the proportion due to heredity among own children is .81, the proportion due to environment is .07 with the remainder of the variance due to the correlation of heredity and environment. From this analysis it is also found that the correlation between the child's heredity and the midparent intelligence is only .42, as compared with the obtained correlation of .86 between midparent intelligence and home environment. Wright points out that this discrepancy is not surprising in consideration of genetic theory. He also presents a more complicated analysis of the causal structure and presents the path coefficients obtained from this analysis.

Leahy (20) studied a group of foster children and a matched group of own children in Minnesota, taking even greater precautions than Burks had that there should not be a correlation between the heredity of the child and the grade of environment in which he was placed. For the children raised in their own homes she found the correlations between their IQ's and various environmental factors to be in the vicinity of .50, while for the adopted children the corresponding correlations were approximately .20. She obtained proportional contributions by squaring the correlation coefficients, concluding that "variance in intelligence is accounted for by variance in heredity and environment combined to the extent of about 25 per cent," in the control group, while in the adopted group "where environment is functioning independently of heredity, variance in intelligence is accounted for by variance in

environment only to the extent of about four per cent." While Leahy's analysis appears to leave 75 per cent of IQ variance unaccounted for, it should be noted that she did not utilize multiple correlations of IQ with environmental factors, that the proportion of variance attributed to heredity might be said to be too small because of the imperfect relation between such measures as parents' intelligence and the child's genotype, and that similarly the proportion of variance attributed to environment might be too small because of failure to measure significant aspects of the environment. The last criticism applies also to most other studies, but use of the multiple correlation technique, as in the California foster child study, is at least a serious attempt to meet the criticism.

A variation of the foregoing analysis was introduced by Burks (3), who used the data of her previous study and that of Leahy to estimate the relative contributions of nature and nurture to average differences between socio-economic classes, as defined by a modification of the Taussig occupational classification. In the California study four occupational classes were distinguished: professional; higher business and semi-professional; lower business; and skilled labor. The five grades of occupation represented in the Minnesota study were classified as: professional; business manager; skilled trades and clerical; semi-skilled; and slightly skilled and day labor. Unfortunately for the generality of the conclusions, the proportions of cases in the higher occupational categories were much greater than the corresponding proportions in the general population. The exposition of the analysis is among the more recondite in this at best obscure field; but the difficulty appears to come from the omission of steps rather than from erroneous inferences. The logic is somewhat as follows:

Assume that child's IQ is the sum of the contributions of the total environment and of heredity, and that the correlation of parental occupational group with child's IQ depends on the correlation of occupation with the environmental and hereditary factors. Assume that the correlation between total environment and occupational group is the same for foster and control children, but that there is no correlation between heredity and foster-parental occupational group among the foster children. Assume that "the partial regression coefficients measuring the concrete effects of" heredity and environment on intelligence are the same for foster and control groups. Finally—and Burks fails to mention this—assume that the regression of child's IQ on father's occupational status is rectilinear. The predicted value of child's IQ for a given occupational class will be the mean value of IQ for that class. Using the formula

for rectilinear prediction, we find that the difference between the mean IQ for a given class and the total mean will equal the regression coefficient times the difference between the rank of the given occupational class and the average occupational rank. This regression coefficient is, as usual, the product of the correlation between child's IQ and occupational class times the ratio of the standard deviations of IQ and occupational class. For the control group the regression coefficient reflects the influence of both heredity and environment; for the foster group the regression coefficient represents the influence of the environment alone. It is then shown that on the basis of the foregoing assumptions, the regression coefficient for the controls can be expressed as the sum of a factor representing the influence of heredity and a factor representing the influence of environment, and that the latter is given exactly by the regression coefficient for the foster children. Thus "the difference in mean IQ of 'own' children grouped according to father's occupation is composed of two additive heredity and environment factors, the latter being given by the corresponding difference in group means of foster children." It is shown that the ratio of the standard deviation of foster group means to the standard deviation of control group means is a measure of the proportional contribution of environment, and the complement to one is an estimate of the proportional contribution of nature.

From her own study Burks arrives at the estimate 34 per cent of variance due to nurture, 66 per cent due to nature; from Leahy's study the estimates are nurture, 22 per cent; nature, 78 per cent. It is not entirely clear why a ratio of standard deviations is used to estimate the proportional contributions, rather than the more usual ratio of variances (standard deviations squared). If variances had been used, a considerably smaller proportion of causation would have been assigned to environment. The assumption of rectilinear regression of child's IQ on father's occupational category is neither particularly reasonable nor is it supported by the data used. The direction of the error thus introduced is not obvious. Burks (in a private communication) has defended the assumption of rectilinear regression on the grounds that the correlation scatters can be made linear by arbitrary choice of the numerical indices attached to the occupations. This consideration alters the assumption only slightly; it is assumed that the same arbitrary numerical indices which make the regression of child's intelligence on parental occupational group linear in the control group will make the corresponding regression linear in the foster group. By inspection of the group means in Table 1 of Burk's article, this assumption is questionable.

A method for analyzing the data from different kinds of twins to ascertain the proportional contributions of heredity and en-

vironment has been presented by Holzinger (**13, 14**) during the same period that the foster child studies were appearing, although the complete presentation of the Chicago twin study by Newman, Freeman, and Holzinger (**25**) did not occur until 1937. The variability of the difference between members of twin pairs was analyzed into the proportion due to heredity and that due to environment by a comparison of correlations between like-sexed fraternal twins and between identical twins, in each case limiting consideration to those raised in their own families. McNemar (**23**) has summarized the assumptions underlying the statistical analysis employed: "a. The trait variance for fraternals equals that for identicals; b. nuture influences are the same for both types of twins; c. differences due to nature are uncorrelated with differences due to nurture; d. the traits are not affected by the asymmetry mechanism; e. the variance due to errors of measurement is negligible." McNemar omitted mention of the basic assumption, namely, that the score of any of the individuals on any of the tests could be considered as the weighted sum of a hypothetical score on heredity and a hypothetical score on environment plus an error of measurement, in short, the same additive assumption that has been the basis for the preceding analyses. The authors conclude that the percentage contribution of heredity is from 75 to 90 for a variety of physical measures, and from 65 to 80 for several measures of intelligence. McNemar points out that measures of finger ridges were used in distinguishing identical from fraternal twins, thus spuriously increasing the differences between identicals and fraternals in this trait and consequently overestimating the effects of heredity. If we exclude finger ridges, the proportional contributions of heredity to physical measures ranges from .75 to .81. And taking into account the fact that the measures of intelligence are less reliable than the physical measures, McNemar shows that the percentage contribution of heredity to intelligence is of the same order of magnitude as its contribution to physical traits, using the statistical methods of Holzinger. The probable direction of errors in the other assumptions is examined both by the original authors and by McNemar, but the possibility of error in the fundamental additive assumption was not mentioned.

A further analysis involved correlating the IQ differences between members of the 19 pairs of separated identical twins with rated differences in their educational, social, and physical environments. The correlation of IQ differences with educational differences was .79, with social differences, .51, with physical differ-

ences, .30. The correlation between differences in educational and social environments was .26. From these values the authors arrive at "coefficients of determination," presumably comparable to the squares of path coefficients derived by Wright's technique: The difference between IQ's of members of separated identical pairs is 50 per cent attributable to educational differences, 10 per cent to social differences, 12 per cent to joint educational and social differences, 9 per cent to physical differences, 19 per cent to unknown causes. It is to be noted that these percentages are based on correlations between differences. Can we really be so confident that the difference between a pair of twins whose IQ's are 80 and 95 is exactly the same as the difference between a pair of twins whose IQ's are 150 and 165? A similar assumption of absolutely comparable units is made concerning rated differences in environment. McNemar calls attention to the fact that most of the correlations are not significantly different from zero, and that the differences between finger ridges correlates .52 with differences in IQ and .63 with differences in Educational Age, both correlations being greater than is required by the five per cent level of statistical significance. "From these values it might be argued that anything can happen with such a small sample, or that these 19 pairs are not all identicals, or that there is an undeniable relationship between finger ridges and mental ability." Or that the correlations based on differences between pairs are not legitimate for these data. The original authors have stressed that the greater differences found between separated identicals than between identicals reared together indicate that statements about proportional influence must specify the range of environment and the range of heredity involved.

Perhaps the first review of studies on the proportional influence of nature and nurture on intelligence is Kelley's (19) chapter in *Psychologies of 1930*. Emphasizing research which was recent at that time rather than a comprehensive survey of the literature, Kelley referred to three studies from the *Twenty-Seventh Yearbook of the National Society for the Study of Education*, those of Burks, Willoughby, and one by Thorndike (36) on the resemblance of siblings in intelligence. He included also such parts of the twin study by Newman, Freeman, and Holzinger as were then available. While specifically questioning the validity of the assumption that heredity and environment compose intelligence in an additive fashion, Kelley adopts this assumption because it is the basis for all discussions of proportional influence. Two portions of

his discussion are an addition to the present one. Thorndike had compared the correlation of .52, which Pearson found to be the average coefficient for the resemblance of siblings in some physical characteristics, with an estimated correlation of .60 for the resemblance of a corresponding group of siblings in intelligence. The difference, according to Thorndike, represents the influence on intellectual development of the environmental similarity occasioned by being raised in the same family. Kelley adds that if we are willing to consider the variance in intelligence as the sum of the variance due to heredity, that due to inter-family differences in environment, and that due to other causes, then the proportion due to inter-family differences in heredity is the difference between the squares of the two correlation coefficients, or nine per cent. He believes, however, that Thorndike's estimate of .60 as the sibling correlation for intelligence is too low, and that the intra-family differences in environment, which Thorndike did not emphasize, are as important in intellectual development as the differences between families. On the basis of these considerations, he suggests 44 per cent as a fairer estimate of the proportionate influence of nurture than the nine per cent implied in Thorndike's discussion. Kelley does not claim much finality for his estimate:

> Unfortunately neither in the case of the 44 per cent mentioned above nor of the 46 per cent derived by Willoughby do we have even approximate probable errors, not to mention systematic errors which may be more serious. I would imagine them to be large in both instances. The closeness of the two figures should be considered a coincidence and not an experimentally established agreement.

In support of the last statement it might be added that the two estimates are derived on the basis of contradictory assumptions: Thorndike assumed that environment acted to raise the sibling correlation for intelligence as compared to physical traits, relatively unaffected by environment, while Fisher's formula, used by Willoughby, assumes that environment acts always to lower correlations between relatives.

While he does not refer in detail to his early study of the relative importance of nature and nurture, Kelley makes use of two of the same assumptions in drawing up a hypothetical table of "Hereditary and environmental contributions to the variance in intelligence of a homogeneous group composed of white children attending the public schools of America." These two assumptions are that the variance due to differences in heredity is constant from birth to middle age and that the variance due to differences in environ-

ment increases with age. In the table of hypothetical proportions, the variance due to environment is zero at birth and equal to the variance due to heredity at middle age. At the eighth year 17 per cent of variation in intelligence is due to environment, at the sixteenth year, 44 per cent. The figures in this table of hypothetical proportions are, Kelley feels, "reasonable from a priori considerations" and consistent with the findings of the other investigators whom he reviews. It is difficult to find any very direct confirmation, either in the data cited or in common experience, for Kelley's statement, included in the table, that the total variation in intelligence at maturity is about twice the total variation in intelligence at birth.

Reviewing both the twins and foster children studies, Shuttleworth (31) derives another estimate of the proportional contributions of nature and nurture. He uses Wright's method of path coefficients, objecting to the previous analysis by Burks on the grounds that she misinterpreted the significance of parental intelligence, and that of Wright on the grounds that he misquoted Burks' results and failed to notice that the foster and control groups were matched for environmental variability.

He begins by assuming that the true IQ deviation from the mean of the population can be expressed as the sum of the amount of the deviation due to hereditary differences, the amount due to intra-family environmental differences and accidental factors and the amount due to inter-family environmental differences. The intra-family environmental differences are assumed uncorrelated with inter-family environmental differences and with hereditary differences. The proportional contribution of intra-family environmental and accidental factors is first determined from Holzinger's data for the correlation of identical twins reared together, assuming that identical twins have exactly the same heredity. The percentage obtained, 3.3, is then used as the proportional contribution of intra-family environment and accidents to the IQ of the foster and control groups, thus assuming that the percentages are the same under these conditions and that the variability of the identical twins was about that of the children in Burks' study. Assuming then that the multiple correlation of .42 between the IQ's in Burks' foster group and the measured environmental factors represented the true correlation between IQ and environment, it follows that the percentage contribution of inter-family environmental differences is 17.6, and the remainder, or 79 per cent, must be due to hereditary differences. Since the control group was matched with the foster group for IQ variability and also environmental variability, and since the proportional contribution of environment is a function of the ratio of the two variances, the proportional contribution of inter-family environment is the same for foster and control children, namely, 17.6 per cent.

It is then shown that in the control children 63 per cent of the IQ variance should be attributed to hereditary differences, whereas the remaining 16 per cent is due to the correlation of heredity and inter-family environmental differences. But, says Shuttleworth, the foster and control groups, matched for variability in IQ and environment, more logically might have been matched for variability in heredity and environment; so he corrects the percentages to approximately what they would have been if the (inferred) variability of heredity in the foster group were lowered to match the (inferred) variability of heredity in the control group, or that of the control group were raised to match the foster group. The percentages vary slightly from those of the original solution. Summarizing the results, Shuttleworth says,

> For California children of non-Hebrew, North European stock reared in the homes of their true parents . . . from 62.6 per cent to 66.0 per cent of the variance of individual differences in IQ is attributed to hereditary differences; from 2.6 to 3.3 per cent of the variance is attributed to accidents and intra-family environmental differences or to factors which make the environment of two children reared in the same family somewhat different, from 13.9 per cent to 17.6 per cent to inter-family environmental differences or to such factors as parental intelligence, family income, and cultural status of the home; and from 16.0 per cent to 20.9 per cent to the joint contribution of hereditary and inter-family environmental differences or to the correlation between endowments and environments.

The data of Leahy were referred to only briefly, as roughly confirmatory of the findings of Burks, but suggesting a higher correlation between heredity and environment.

Woodworth (**39**) recently has reviewed the most important of the foregoing studies and in some cases has introduced his own statistical analysis of the results. In evaluating the data of Newman, Freeman, and Holzinger, he arrives at the proportional contribution of environment by dividing the average difference between members of identical pairs reared together by the corresponding average difference for fraternals. When account is taken of the error of measurement in the IQ scores,* it is seen

* In his monograph Professor Woodworth does not explain how correction for the error of measurement is made. In reply to a request for information on this topic, he showed that the correction assumed (1) that the true difference between a pair of twins is uncorrelated with the difference due to error, and (2) that the ratio of the mean deviation to the standard deviation is constant for the distributions of true differences, of differences due to error, and of obtained intra-pair differences. Both conditions must hold for the fraternals and for the identicals

that environment produces approximately 40 per cent of the intra-pair differences for height, weight, and intelligence alike. Similarly, for the intra-pair correlations in the same three traits, the identicals show a higher coefficient of resemblance in all three; when allowance is made for attenuation due to the unreliability of the IQ measurement, "the data afford no ground for making any distinction between the three traits, as concerns the shares of heredity and environment." In reviewing Burks' study, Woodworth follows her in using the square of the correlation coefficient as a measure of the percentage variance "accounted for" by a given set of factors.

From the correlation of .61 between child's IQ and a combination of parental and home ratings, he infers that "inter-family variation in heredity and environment combined accounts for $.61^2 = .37$ of the variance of own children." He does not follow Burks in attributing most of the remaining 63 per cent of variance to heredity, but refers it to whatever factors "operate within the same family to make siblings differ." Using the correlation of .42 between foster children's IQ and home ratings, he states that "the 18 per cent of IQ variance due to inter-family variation in environment (in the case of foster children) is directly comparable with the 37 per cent due to heredity and environment combined (in the own children)." The simple process of subtraction yields 19 per cent of variance due to inter-family differences in heredity, but here Woodworth has neglected the possibility of a correlation between good heredity and good environment among own children. From Leahy's study he took the correlation between child's IQ and the total home rating, based on occupation, parental education, and economic and cultural level. Squaring the correlations of .23 for foster children and of .53 for own children, "gives only 28 per cent of the total variance of own children attributable to the inter-family variation in heredity and environment combined, and only 5 per cent attributable to inter-family variation in environment alone, leaving 23 per cent due to inter-family variation in heredity." He points out that the discrepancy between these percentages and those from the California foster study may be due to failure to use multiple correlation. Since the total home rating is a composite, and multiple correlation is essentially correlation with an optimally weighted composite, the objection might be rephrased to say that Leahy's correlations were lowered by the inclusion of irrelevant home factors or by weighting too heavily factors which were unimportant in determining the intellectual stimulation of the home.

From these and other studies Woodworth concludes, "The most striking feature of these results is the small share that can be attributed to inter-family differences in environment. Not over a

reared together. Condition (2) will hold if the forms of the three distributions are alike. In particular, the assumption is valid if all the distributions are normal, and there is reason to believe that this is approximately true.

fifth, apparently, of the variance in intelligence of the general population can be attributed to differences in homes and neighborhoods acting as environmental factors."

III

Since 1928 the analyses of the proportional contributions of heredity and environment to intelligence have utilized mainly two techniques, Wright's method of path coefficients, and the square of the correlation coefficient. Prior to 1928 Fisher, Dahlberg, and Kelley used methods which were essentially ways of analyzing trait variance into proportions due to heredity and to environment, on the assumption that the trait measurement is a weighted sum of hypothetical measurements of heredity and of environment. Further assumptions, necessary to show the relevance of obtainable data to the weights to be assigned to heredity and environment in this hypothetical summation, differed in the studies of these three investigators, as did also the nature of the data used. The additive assumption, that is, the assumption that heredity and environment add up to make IQ, is common to the subsequent papers using path coefficients and the square of the correlation coefficient. This additive assumption has not always been stressed by the authors of papers analyzing experimental data, but it is to be found clearly in all the papers discussing primarily the methodology of analyzing causation.

Wright (**41**) has admitted that the fundamental additive assumption is a limitation to the use of the path coefficient technique. In one paper (**40**) he showed something of the general conditions under which the additive assumption would offer a sufficiently close approximation to the correct value of an effect which was actually made up of the *product* of two causes. He does not attempt to justify making such an additive assumption in general, and in actual applications of his technique (**40, 43**) he does not examine the appropriateness of additivity of causes.

Tryon (**37**) has discussed the interpretation of the coefficient of correlation between X and Y in terms of the degree of determination of Y by X.

The degree of determination of Y by X may be defined either as the per cent of the correlation of Y with its complete composite (i.e., unity) which the correlation with X contributes, or as the per cent of the total variance of Y which the variance of X alone contributes. If we assume that Y is equal to X plus residual factors, then the square of the correlation between X and Y gives the percentage of determination of Y by X. In discussing applications of this formula, Tryon points out that given a

correlation, it is often far from obvious which variable is to be considered as determining the other one. A more general case is covered by the assumption that X and Y are each equal to a common variable C plus their respective residuals. Then the determination of Y by the common variable C, which might also be called the determination of Y by X, is given by the square of the correlation between Y and C, shown to equal the ratio of the square of the correlation between X and Y to the square of the correlation between X and C. For this case it is necessary to know the correlation of either X or Y with C in order to ascertain percentages of determination. If we may assume that X and Y are equally determined by C, then the correlation between X and Y is itself the percentage of determination of each by the common factor. Using a method developed by Spearman, it is possible to find the correlation between either X or Y and C by means of two other reference variables sharing the same common factor. Tryon offers several objections to Nygaard's (**28**) discussion of a percentage interpretation of the correlation coefficient; Tryon's paper also makes clear that we cannot, with Nygaard, equate the percentage of dependence of Y on X with the percentage of mutual dependence between X and Y. Interpretation of the correlation coefficient in terms of number of overlapping elements in X and Y is shown to be a special case of the foregoing, specifying the nature of the common and residual variables in X and Y.

Tryon shows that his usage of "degree of determination" corresponds to the square of Wright's path coefficient, which is what Wright also calls percentage of determination. Finally, Tryon points out the assumption implicit in his entire discussion, namely, that the variables X and Y are composed by adding the common factor to the factor specific to each variable. In justification of the additive assumption he quotes Spearman (**32**): "Surprise may be felt that the measurement . . . should so simply consist of merely the *sum* of these added together. . . . The answer to this question is that our proof has depended upon usage of Taylor's theorem, according to which all mathematical functions however complex can, in general, be expressed in the above simple additive form with some approximation."

Dunlap and Cureton (**8**) have discussed partial and semi-partial correlation, path coefficients, coefficients of determination and multiple regression equations as methods in the analysis of causation. They show that all of these techniques depend for their significance on an analysis of the variance of the effect into the proportions of variance due to the various causes. "The application of all forms of correlation to the solution of the problems of causation rests for its interpretation on the principle of the analysis of variance." This principle states that *if* the score on the dependent variable is the sum of scores on a set of independ-

ent variables, then the variance of the dependent variable is the sum of the variances of the independent variables.

Similarly, Monroe and Stuit (24) have said, "It is frequently desired to secure measures of the contributions of two or more causes to a given effect or dependent variable. A basis for accomplishing this is an algebraic equation which expresses the dependent variable as a linear function of the independent variables given as causes." It is not necessary that the "independent" causes be uncorrelated. As justification for the additive assumption which underlies all interpretation in terms of causes, they quote Kelley's (17) fundamental linear theorem. Their discussion includes the correlation coefficient, variance ratio, partial and multiple correlation, path coefficients, and factor analysis. The passage of Kelley's to which they refer is essentially the same as the quotation from Spearman, invoking Taylor's theorem as the justification for expressing scores from different tests in terms of a common factor plus a factor specific to the given test. Kelley puts rather mysterious qualifications on the use of the linear assumption; the trait must be one "such for example as computation ability, which grows in the single individual from time to time and changes from individual to individual in an essentially homogeneous group in a manner not markedly saltatory," and the mean value for the group must not be small with reference to the standard deviation. The relevance of these qualifications to the use of Taylor's series is not shown, and in particular, the importance of the magnitude of the mean is hard to see, in view of the fact that the scores are expressed in deviations from means in constructing Taylor's series.

While these reviews have not included Holzinger's technique for analyzing the data from different types of twins, it is clear from his own expositions that it is based on the same additive assumption. Like the other techniques, it uses correlations to obtain the variances of the hypothetical heredity and environment factors.

IV

It is rather remarkable that although all of the techniques for analyzing the proportional influences of heredity and environment on intelligence depend on an additive assumption, only one of the papers utilizing the techniques with actual data has contained an examination of the appropriateness of the assumption. The methodological papers on analyzing causation either have not

examined the assumption, or have justified its use in an equally special case, or have justified it by a desultory reference to Taylor's theorem. But there also have appeared papers criticizing the entire attempt to assign proportions to the contributions of heredity and environment to intelligence, and it may be supposed that these criticisms are directed essentially at the fundamental assumption.

Niles (**26**) criticized at length the method of path coefficients, stating, among other things, "The basic fallacy of the method appears to be the assumption that it is possible to set up *a priori* a comparatively simple graphic system which will truly represent the lines of action of several variables upon each other, and upon a common result." Wright (**42**) replied that while such a diagram of causation is not generally possible, his method was applicable where such a diagram could be drawn up, and, in addition, provided a means of checking the appropriateness of assumptions concerning causal relations. Niles (**27**) answered that the appropriateness of the assumptions of causal relations could be checked only where one already had the information which the method of path coefficients claimed to supply, in which case the method is useless.

Hogben (**12**) shows that correlation can be used to detect the existence of genetic differences for a given trait in a given population, but he questions the meaningfulness of Fisher's attempt to quantify the relative influence of genetic and non-genetic causes of variation.

He cites the experiment of Krafka on the fruit fly *Drosophila*, demonstrating that the *form* of the curve expressing the dependence of number of eye facets on temperature at which the larvae are raised varies with the genetic constitution of the fly. That is, the amount of contribution of genetic differences to differences in number of facets depends on the environment in which the larvae are raised, and similarly, the amount of contribution of specified environmental differences to differences in number of facets depends on the genetic constitution of the larvae.

The percentage contribution of environment can be defined only as the amount of variation in the trait when heredity is constant divided by the amount of variation in the trait when both heredity and environment vary. Several of the authors reviewed above have been careful to point out that statements about proportional contributions must specify the amount of variation in heredity and environment in the population for which the proportions hold. But this qualification is not enough to rescue meaning for the proportions, for if the amount of variation in the trait

when heredity is constant depends on the particular constant value of heredity, we shall have more than one answer, and thus no answer, for the proportional contribution of environment. Again, Hogben says, "From an experimental standpoint, what do we mean by making the environment uniform? We can do so in an infinite number of ways, some tending to bring out genetic differences which were not previously measurable, others tending to obscure genetic differences which were measurable before. Has a balance sheet of nature and nurture any meaning in this sense, unless we assume that the variance of a population, if affected at all, is necessarily diminished when the environment is made more homogeneous?" That such an assumption is false can be established with a single example, and Hogben gives further findings on Drosophila showing a type of genetic difference which would be accentuated in a particular constant environment. Can we consider the constant environment to be an average of the environments within the experimental range? In the case of number of facets in fruit flies with one of the genes for "bar eyes" we know that the expression of hereditary differences depends on the temperature in which they are raised, and an average temperature has a definite significance. But an average value of environment "would not have an equally definite significance for the study of human populations exposed to an indefinitely large number of as yet unmeasurable and unidentified environmental differences. Nor would any balance sheet drawn up on such an assumption entitle us to set limits to changes which could be produced by controlling the environment."

Another British biologist taking an essentially similar point of view is Haldane (**11**), who has written, "The important point is to realize that the question of the relative importance of nature and nurture has no general answer, but that it has a very large number of particular answers."

Among psychologists, too, there have been critics of the causal analysis. Kelley (**18**), in commenting on Burks' (**1**) discussion of the use of partial and multiple correlation for analyzing nature and nurture, protests that one should not try to reach conclusions concerning such unmeasured, abstract entities as nature and nurture, but should be content to describe the properties of the correlations that can be observed.

Schwesinger (**29**), in analyzing the heredity-environment problem, also argues against seeking too general solutions:

The problem of heredity and environment must therefore be thought of not only as specific to each characteristic and to each environment, but as specific to each individual in respect to each of his characteristics, and to each factor of his environment. . . . We cannot speak of a good or of a bad environment except in terms of a particular characteristic of a particular individual, and of particular environmental factors.

While these authors have criticized the meaningfulness of the "balance sheet of nature and nurture," none of them has shown explicity at what point the often careful reasoning of the discoverers of proportional contributions has been erroneous. It will be the contention of this paper that the error lies in the common additive assumption. This contention differs from the point of view of the quoted critics only in explicitness, for three of the authors cited have also criticized the additive assumption, although in somewhat different contexts than their criticisms of the meaningfulness of the problem. Schwesinger has cautioned that changing the variability of nature or nurture would change their proportional contributions. The criticism is commonly known, and not decisive, for a similar criticism could be made of any coefficient of correlation. Kelley (**19**) has recognized that statements of proportional contribution rest on an additive assumption; he believes that an assumption that heredity and environment are multiplied to produce the trait value is just as reasonable, but it does not permit the analysis of percentage causation. His own arguments were not so convincing but what he could state, in the same article, intuitive values for the proportional contributions of nature and nurture. Hogben questioned Holzinger's nature-nurture ratio, based on the comparison of identical and fraternal twins, because "In dealing with intellectual resemblances, we have to remember that the greater physical similarity of identical twins may be associated with a more restricted choice of environment." In the discussion of the validity of Holzinger's methodology, Hogben does not seem to distinguish clearly between the question of whether heredity and environment can be treated as additive and the question of the correlation between good heredity and good environment with respect to their distribution in the population.

V

When is it justifiable to make an assumption? The answer may differ with the problem at hand, but the following requirements seem quite general. (A) The assumption must mean something. (B) It may be shown to be approximately true on the basis of

evidence from other fields of discourse, or alternatively, (C) it must be possible to show that the error committed by making the assumption is not larger than a certain amount dictated by the uses for which the results are intended. Condition (C) requires that some results based on the assumption be susceptible of empirical proof. The burden of this discussion will be that the additive assumption concerning the causation of intelligence is ambiguous in meaning, is not supported by any known evidence, and leads to no results capable of empirical verification.

As two papers have referred to Taylor's theorem as a justification of the linear or additive assumption, we may begin by considering exactly what this theorem states.

Taylor's theorem says (**10**): Given $y=f(x)$, where x is expressed in terms of deviations from some mean value, then y can be expressed as the sum of an infinite power series of x, with coefficients which are essentially derivatives of $f(x)$ evaluated at the origin, provided that the remainder after n terms tends to zero as n increases. Note that the expansion of the function y as a power series of its independent variable x is by no means always valid; the validity of the expansion depends on the remainder tending to zero. In order to show that the remainder tends to zero, it is necessary to have an analytic expression for the original function, and this function must have derivatives of all orders. Spearman's claim that "all mathematical functions, however complex, can, in general," be expressed by Taylor's series, is certainly wrong. Mathematical functions do *not*, in general, possess derivatives of all orders. Furthermore, the assumption that y can be expressed as a linear function of x is even more restrictive, necessitating that a good approximation to the value of the whole series be obtainable from the constant term and the term containing the first power of x. Granted that the function can be expressed by Taylor's series, that is, that the remainder after n terms tends to zero, it by no means follows that the remainder after *one* term is negligible. The goodness of approximation afforded by the first term, that is, by a linear expression, depends on the requirements of the problem, on the variability of x about its origin, here taken as the mean, and on the nature of the original function of x. It is impossible to ascertain the goodness of the approximation without knowing something about the functional relation between y and x, just as it is impossible to know whether Taylor's theorem applies at all without some such knowledge.

In the nature-nurture discussion, IQ has been the dependent variable y and at least two independent variables have been assumed, heredity and environment. Sometimes there have been assumed two independent environment variables, intra-family and inter-family.

Taylor's theorem for functions of two variables, x and z, states that $y=f(x, z)$ can be expressed as the sum of an infinite series of polynomials

homogeneous in x and z, with coefficients which are essentially the partial derivatives of the function. The conditions under which the infinite series represents the function correspond to the condition of the remainder tending to zero. Again, in general the best linear function of x and z will not be a good approximation to the value of y. Assuming that the Taylor's expansion is valid, and assuming that the first terms in x and z afford some degree of approximation, the goodness of approximation depends on the requirements of the problem, on the nature of the function $f(x, z)$, and on the variation of x and z about their respective means. Taylor's series for a function of three variables is a corresponding extension of the series for two variables.

Is it legitimate to say that because IQ is a function of heredity and environment, Taylor's theorem justifies the expression of IQ as a sum of heredity and environment? Quite apparently not. Taylor's theorem refers to a mathematical function possessed of partial derivatives of all orders. We do not know any mathematical function which expresses the relation of IQ to nature and nurture. In fact, it is highly doubtful what is meant by "heredity" and "environment" in this context. It is by no means clear that there is a linear continuum of "mental heredity"; there is good reason to suppose that there is not an unambiguous scale of "mental environment," as the writer (**22**) has had occasion to discuss elsewhere. Heredity and environment are not single-valued mathematical variables; they are related to IQ, but not by means of any known mathematical function, simple or complex. Thus Taylor's theorem offers no justification for the additive assumption basic to the discussion of the proportional contributions of heredity and evironment to intelligence.

Let us assume, however, that it is possible to assign a numerical value to intellectual heredity, and that numerical values can be assigned to one or more aspects of environment as they pertain to intellectual development. Can we then say that IQ is even approximately the weighted *sum* of these numbers? To do so is equivalent to saying that the contribution of a given environment to IQ is the same no matter what heredity it acts upon. This direct implication of the additive assumption does not seem to have been recognized by most of the authors in this field, it has been argued against by some of those who have accepted the additive assumption, and most important, it is inconsistent with what we know of animal genetics and of clinical psychology.

In utilizing the path coefficient technique in the foster child study, Burks (**2**) wrote,

This situation is a particularly favorable one for using the Wright technique, for the assumptions regarding causal relations are here at a minimum. It is only necessary to assume that parental intelligence and home environment affect the child's IQ, but that the child's IQ does not contribute to these. It is not necessary to make any assumption at all regarding a possible causal or interacting relationship between parental intelligence and environment; merely the known correlation between the two is sufficient.

Similarly, Shuttleworth (30), on the same page on which he explained the necessity for the linear assumption in his analysis, said, "No assumption needs to be made concerning the nature of the interaction of hereditary and environmental differences." But the linear, or additive, assumption is equivalent to a statement that there are no interactions between heredity and environment, as the term interaction is used in statistical discussions. What Shuttleworth and Burks probably meant to say was that their techniques involved no assumption about the nature of the relation between heredity and environment in terms of their distribution, or correlation, in the population. The distinction is subtle, but crucial: The issue is not whether heredity and environment are distributed randomly with respect to each other, but whether a given grade of environment produces a given IQ increment regardless of the grade of heredity raised in that environment.

Burks (1), in a publication simultaneous with the foster child study, emphasized with italics the remark, "Environment may have different degrees of influence when the endowment for a given trait is of larger or smaller amount," which is a way of stating that there are interactions between heredity and environment. The data to which she referred concerned the inheritance of physical stature, and the results she quoted could be accounted for as well in terms of a mean rise in height uniform throughout the filial generation as in terms of the differential effect of environment on different heredities. Nonetheless, it is interesting that she apparently did not see that this idea, the interaction of heredity and environment, is in direct opposition to the additive assumption underlying the path coefficient technique. Thorndike (35) was probably expressing a similar criticism of earlier studies when he wrote, "Many of the false inferences about nature *versus* nurture are due to neglect of obvious facts," among which he included "that the problem of relative shares, where both are effective, includes all the separate problems of each kind of environment

acting with each kind of nature. Any one estimate for all cases would be absurd."

It is not easy to find explicit evidence of the interaction of heredity and environment in determining human traits, especially since the exact heredity and the relevant aspects of environment are difficult to ascertain. The example of the number of eye facets in Drosophila, quoted from Hogben, is an excellent illustration of the interaction of hereditary and environmental determiners. Both Hogben and Haldane give a large number of examples from general biology emphasizing that the effect of a given nurture depends on the nature on which it acts. It seems fully as plausible that this type of interaction is the general rule in development as to assume that there is no interaction.

Woodworth, while accepting Shuttleworth's use of the word interaction, appears also to be concerned with the problem as stated here since he adds a sharp distinction between the "objective environment" and the "effective environment." "Within the same home, then, two children may have very different effective environments for the reason, at bottom, that they differ genetically. Quite possibly this is the most important fact in the whole problem of heredity versus environment." The extent to which a child can choose his own level within a given environment will depend on the rigidity and limitations of the environment, he says. Thus the extent to which a child's mental development is influenced by intra-family differences depends on the nature of his mental heredity and on the nature of his family environment. The measurable aspects of environment, those which have been presumed to have a predictable effect on the intellectual growth of the child, are those which are ordinarily the same for two children in the same family. These aspects Woodworth calls the objective environment. The environmental differences within the family, modifying the effect of the measurable aspects, constitute what Woodworth calls the effective environment and substantially what Kelley and Shuttleworth have called intra-family differences in environment. Woodworth takes exception to the view of Burks—he might have added Wright and Leahy—that the variance in intelligence not shown to be due to measurable or inter-family differences in environment must be due to heredity. This view neglects the importance of differences within the family. Kelley has already been quoted as making a similar criticism of a statement of Thorndike's. From his own review of some of the

above and some other studies, Woodworth draws the significant conclusion, "The main causes of variation seem not to be such as differentiate one family from another in environment, or in heredity either. The causes, genetic and environmental, which make siblings differ seem to be more potent than those which differentiate one such family group from another."

Perhaps we can save the additive assumption, and consequently, the percentage analysis of causation, by postulating two environmental sources of variation, inter-family and intra-family differences. Attempts in this direction were made by Kelley (**19**) and Shuttleworth. Kelley simply decided that intra-family differences were as important as inter-family differences. Shuttleworth's method was even less acceptable. He supposed that the proportional effect of intra-family differences in environment could be estimated for children in general using the data from identical twins reared together, in whose case the heredity is presumably identical, and the environment much more nearly identical than for ordinary siblings. Surely the effect of intra-family differences would be far greater for children of opposite sex, of different birth orders, and for children who start with widely differing capacities and personality tendencies. Shuttleworth's estimate of three per cent of the variation in intelligence being due to intra-family variations in environment cannot be considered seriously, for it does not reflect the true extent of differences in family position, nor does it take care of the objection that a given measurable environment may have different effects on the intellectual development of children differing in mental endowment.

An acceptable estimate of the importance of the interaction of mental endowment and measurable environment in determining mental development is not given in any of the studies reviewed here. Is it likely that a statistical technique will be constructed, or a present technique modified, to enable us to estimate the significance of interactions? There is a very essential reason for the answer being negative. It must be remembered that in analyzing the proportional contributions to variance in intelligence, we do not deal with differences in mental heredity in terms of the great variety of mental qualities, but in terms of a single numerical index, and we do not deal with the environment in terms of its rich texture of subtle influences, but again only in terms of a single numerical index.

In order to apply statistical methods, we must have replication of a given set of conditions. In this case, replication implies that two children with heredity of, say, +.7 standard deviations and environment of, say, +1.2 standard deviations, would be considered exactly alike, not only in point of heredity and environment but also of interaction of heredity and environment. That is to say, it would be possible statistically to estimate the interaction of a given numerical heredity with a given numerical environment.

To do so by the methods now available would be necessarily to neglect those factors which we know from clinical psychology to be of greatest importance in the dynamics of human development, namely, the relationships of the child to the people and the circumstances of his milieu. We are far from knowing which personality factors in the child and in his parents and in his siblings are of maximum importance in mental growth. There is slight hope that the relationships and personality traits significant in the interaction of hereditary and environmental determiners of intelligence can be captured in one or two or half a dozen numerical indices; yet this is the condition for a percentage analysis of the causation of intelligence. While a study of the dynamic factors in the genesis of intelligence may not lead soon to a numerical evaluation of their relative importance, it will be of highest interest to psychological theories and quite possibly crucial to educational and clinical practice.

The really important criterion of the additive assumption is: how useful—and therefore how accurate—are the results obtained by making this assumption? The authors of some of the works reviewed have indeed drawn conclusions of wide social significance from their percentages. Kelley (16) found that for computation ability environment exerted a leveling influence, while it increased idiosyncrasy in history and literary information. "Should not our national educational institutions tend more strongly to a common level of achievement in History and Literature Information than towards such a level in Computation ability?" he inquires. For reading and history are "more intimately connected with the universal duties of citizenship," and literary and historical knowledge and aspiration are the meeting ground of alien people. The interests of democracy will be better served, he feels, by less equalization of computational ability and more equalization, say, of knowledge of history. But does not every citizen have to buy a loaf of bread? There is nothing compelling about his argument

that people ought to be relatively more alike in certain subjects than in others; a still graver lack is that he provides no way of finding out in the course of applying his conclusions concerning "idiosyncrasy" whether they are approximately correct.

Shuttleworth (**30, 31**) applies his results to the whole question of how best to improve the general intelligence of mankind. Admitting a certain number of broad guesses enter into the computations, he nevertheless feels it possible to make statements of the type, "The estimated increase in the average Stanford-Binet IQ is fifteen points for the past century and seven points for the next or a total indicated increase in the average IQ of twenty-two points." How shall such statements, even about the future, be tested? The content of IQ tests goes out of date, and when the tests are restandardized, the average will again be 100. How can we control such factors as widespread acquaintance with testing methods, which may very well influence the general level of response? Suppose we could solve these methodological problems. It is still doubtful that there could be a sensible answer to the question, "How far is it possible to raise the national IQ by improving the environment?" If it were found that the Stanford-Binet IQ is much influenced by environment, it might well be concluded, not that intelligence is influenced by environment, but that the Stanford-Binet is a poor test of intelligence because it is influenced by environment. McNemar (**23**) has said something very like this concerning tests of educational achievement, which have, after all, quite a high correlation with tests of intelligence. "The injection of educational achievement . . . introduces data which have little bearing on the classical problem as to the influence of nurture on tested ability, and therefore the unquestioned finding that achievement and personality are dependent partly upon environmental conditions cannot be accepted as of crucial importance in connection with the main problem." If it were found, on the other hand, that there is some measure of intelligence not influenced by environment, will we then cease to improve the environment? Certainly not, for it is an "unquestioned finding that achievement and personality are dependent partly upon environmental conditions." The "main problem," the "classical problem," to which McNemar refers, has a long history of elusiveness.

Not only is the classical problem of heredity *versus* environment still unsolved; some psychologists have questioned, from

various points of view whether it is the "main problem." In connection with recent studies on raising the IQ during the pre-school years, Burks (4) has commented that it is not necessarily desirable to stimulate the maximal mental growth during this period. The pre-school years have been shown to be extremely important in the formation and integration of the child's personal and social attitudes, and Burks suggests as more important than simply raising the IQ "that the growth of adaptive behavior should be stimulated and guided—often in special areas instead of all areas—so as to achieve a harmonious balance with the expanding personality needs of each particular child." An interesting possibility for the study of crucial factors in the development of adaptive behavior as a whole is exemplified in Burks' (5) detailed clinical study of a pair of identical twins reared apart. Line and Kaplan (21), also in connection with the influence of nursery school in raising the IQ, offer reason to believe that such a rise as has been observed can be accounted for by a social adjustment factor, whose acquisition is facilitated by pre-school attendance. They urge the evaluation of educational efficiency in terms of concepts with more explicit functional connotation than is possessed by "the IQ." Hogben has objected to the overemphasis on improving intelligence from another point of view: "To the writer it seems that the selfishness, apathy and prejudice which prevent intellectually gifted people from understanding the character of the present crisis in civilization is a far greater menace to the survival of culture than the prevalence of mental defect in the technical sense of the term."

It is the view of this paper that the validity of the additive assumption underlying the analysis of the causation of intelligence must be tested finally in terms of the empirical verification of the results of such analysis. The "practical applications" mentioned by the authors in this field are not rigorously deduced from the percentage analyses and do not afford a means of evaluating the correctness of the results in the course of applying them. Another way of approaching the problem of applications is to ask what problems need to be solved and then to inquire whether the results of the causal analysis can be of use in solving them. A very practical aspect of studying foster children has been mentioned by various authors, namely, that people who adopt children want to know in advance something about what the children are likely to become. The prospective foster parent will hardly want to

know the percentage of determination of the child's IQ by foster and own parentage; average values and dispersions and even correlations are more intelligible and more relevant than the final percentage statements about causation of differences. The rigorous exclusion of selective placement of children with respect to their probable intellectual levels, which is a part of the experimental isolation of the variables, is not necessarily the best way to obtain information concerning the most favorable placement policy. Another problem which some people believe to be of practical importance is the extent to which the prevalence of feeble-mindedness can be reduced by eugenic measures. Again, statements about percentage determination of intelligence are of little direct application; far more relevant would be studies exclusively of feeble-minded children and of their response to environmental improvements. The feeble-minded have, in fact, been excluded from the preceding studies. It appears that there are at present no practical applications or accessible consequences of the percentage analysis of the causation of intelligence in terms of which to test the accuracy of the various estimates.

Not much has been written recently on the numerical evaluation of the causes of intelligence, so that it may seem unimportant to have inquired so fully into the assumptions and utility of this line of research. It has been succeeded in popularity by research concerning the effects of nursery school on IQ, and many of the same considerations hold for these studies. Certainly "environment" means something more definite in the nursery school studies, but "the IQ" has become even more ambiguous because of the measurement difficulties peculiar to the pre-school years. It is still relevant to say, with Burks, that increasing the IQ is not the problem of central importance in the development of the child; with Line and Kaplan, that increasing the IQ is not the most essential problem from an educational view; and with Hogben, that increasing intelligence is not a focal problem from a social view. It may be said that whatever the practical importance of these heredity-environment studies, they are of theoretical importance. But the theoretical conclusions can be tested most convincingly by applications. If there exists a chasm between theoretical genetic psychology and applied genetic psychology, either we are not applying what we know, or we are not constructing theories about the most crucial aspects of human development. Indeed, one of the most fascinating junctures of theoretical

and applied psychology promises to lie in just that field, the dynamic interaction of heredity and environment, which was assumed not to exist in computing the "balance sheet of nature and nurture."

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PSYCHOLOGY AND THE WAR

Edited by
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THE AVIATION PSYCHOLOGY PROGRAM OF THE ARMY AIR FORCES

STAFF OF THE PSYCHOLOGICAL BRANCH, OFFICE OF THE AIR SURGEON, HEADQUARTERS ARMY AIR FORCES

Washington, D. C.

The present article is the first in a series describing the Aviation Psychology Program of the Army Air Forces. This report treats the general organization and the historical development of this program up to October 1943. The last section deals with some of the recent and impending changes in the Aviation Psychology Program. Later articles will deal with specific aspects and areas of research.

1. The Psychological Testing Program for Air Crew*

Every man who applies for training as an Aviation Cadet is given a psychological examination to determine his general suitability for aircrew training. Men who score below the passing mark are not accepted. After entering the Army, the accepted applicant takes another examination to determine his educational background. The results of this educational examination are used for planning a five months' college training program. Finally each man is given a comprehensive series of classification tests at one of the Army Air Forces Classification Centers. These classification tests form the basis of an assessment of each man's proficiencies and special aptitudes for training as a pilot, bombardier, or navigator.

The purpose of this extensive use of psychological tests in the Army Air Forces is to select from the many applicants those men who are best fitted for aircrew training and to assign each of them to the type of training for which he is most suited. Through such a program the Army Air Forces secures a larger number of men who possess the psychological requirements for becoming first rate pilots, bombardiers, and navigators, and at the same time greatly improves the efficiency of the aircrew training program by reducing training wastage.

2. History of the Psychological Testing Program

During the interval between World War I and World War II, the problem of the selection of men to be trained as military pilots

* The first article dealing with the Aviation Psychology Program published in a psychological journal is: Flanagan, John C. The Selection and Classification Program for Aviation Cadets. *J. consult. Psychol.*, 1942, 6, 229–240.

was by no means without attention. In this country most of the research on aptitude tests for pilots was carried on by Flight Surgeons at the School of Aviation Medicine at Randolph Field, Texas. When the Air Forces began to train greatly increased numbers of pilots several years ago, it became increasingly important to develop objective psychological tests to be used in selecting men for this training. The interest of the Flight Surgeons in this problem made it logical to assign to the Office of the Air Surgeon responsibility for developing such tests. In June 1941, approval was given to the establishment of a psychological research agency in what is now the Office of the Air Surgeon. A small staff of professionally trained psychologists who were interested in the problems of Aviation Psychology was assembled. The initial work of this group was confined entirely to research. Psychological Research Units were established in each of the three centers of the Army Air Forces Training Command. Another research unit was established at the School of Aviation Medicine and later a fifth unit was established at Headquarters of the Training Command. In the fall of 1942, Psychological Research Detachments were sent to Army Air Forces Flexible Gunnery Schools.

The first psychological tests were given to Aviation Cadets in October 1941 at Maxwell Field, Alabama. Before deciding upon the psychological tests to be tried out for research purposes, extensive studies were made of all of the available information concerning the prediction of pilot aptitude. Conferences were held with officers of the Army Air Forces and with members of the National Research Council Committee on Selection and Training of Aircraft Pilots. Special studies were made of the training program of the Army Air Forces and of the reasons given for the elimination of cadets from flying training.

Soon after the research was undertaken it became evident that the program should be coordinated with similar research on the bombardier and the navigator. In December 1941, all psychological research of the Army Air Forces concerning pilots, bombardiers, and navigators was assigned to the Air Surgeon.

Before any of the original research projects were completed, the exigencies of the war made it necessary to change from a research program to a combined research and operating program. The first form of the Aviation Cadet Qualifying Examination was prepared and put into use early in 1942 for the original selection of applicants for Aviation Cadet training. Additional psychologi-

cal tests were selected for use at Army Air Forces Classification Centers for the purpose of determining the suitability of Cadets for various types of aircrew training. The tests that were used in this original program and the interpretation of the test results were based on an analysis of all the information available at that time and the judgment of the aviation psychologists on duty with the Air Forces. As research findings became available, refinements were made in tests and procedures. As a result, there has been a steady improvement in the selection and classification tests, as shown by the results that have been obtained in recent months.

At the end of the Fiscal Year 1943 (June 30) there were 85 Aviation Psychologists on duty in the Army Air Forces, all officers with professional training and experience in the field of psychology. Approximately eighty-five per cent of these men have advanced degrees in psychology. In addition, approximately 300 enlisted men were assigned to this program as Psychological Assistants. Practically all enlisted men have a college degree with a major in psychology or its equivalent. Thirty-five per cent have the Master's degree and six per cent the doctorate.

Lieutenant Colonel John C. Flanagan in the Office of the Air Surgeon, Headquarters Army Air Forces is the ranking Aviation Psychologist responsible for the technical supervision of the Aviation Psychology Program. In the original organization, Psychological Research Unit #1, Nashville, Tennessee, was directed by Lieutenant Colonel Laurance F. Shaffer. Psychological Research Unit #2, San Antonio, Texas, was under the direction of Lieutenant Colonel Robert T. Rock, Jr. Psychological Research Unit #3, Santa Ana, California, was directed by Lieutenant Colonel J. P. Guilford. Major Arthur W. Melton was in charge of the Department of Psychology, School of Aviation Medicine. Lieutenant Colonel Frank Geldard was chief of the Psychology Section, Office of the Surgeon, Headquarters, Army Air Forces Training Command. Later articles in this series will describe the organization, functions, and research accomplishments of these organizations, and the activities of recently established units.

In the Army Air Forces the Aviation Psychology Program has been the responsibility of Major General David N. W. Grant, the Air Surgeon, and Colonel Loyd E. Griffis, Chief of his Research Division. Brigadier General Eugen G. Reinartz is Commandant of the School of Aviation Medicine and Brigadier General Charles R. Glenn is Surgeon for the Army Air Forces Training Command.

3. Outline of the Aviation Cadet Selection and Classification Program

Aviation Cadets are selected from men who are already in the Army and from civilians. Application is first made to one of several

hundred Aviation Cadet Examining Boards located throughout the country. The applicant must be between 18 and 26 years of age inclusive. Recently, a special program has been opened to 17-year-old men who are placed in the enlisted reserve until they are 18. At the Aviation Cadet Examining Board, the applicant must show evidence of officer qualifications. He is given the Aviation Cadet Qualifying Examination and a special physical examination for flying duty. Men who successfully pass these examinations are accepted as applicants for aircrew training, but are not assigned as Aviation Cadets until a later time. The training program calls for a period of basic military training followed by five months in a college or university. Following this, under the plan in effect prior to October 1943, the individual was sent to a Classification Center where he was given the Psychological Classification Tests and a final type physical examination, his preferences were determined, and he was assigned to a specific type of training. The newly appointed Aviation Cadet next undergoes further training in a pre-flight school, and then enters upon his pilot, bombardier, or navigator training.

4. The Psychological Aptitude Tests

A. The Aviation Cadet Qualifying Examination. The initial psychological selection test has been developed for ease of administration by individuals who are not professional psychologists. The first eight forms are power tests for which a very liberal working time is allowed. Examinations contain 150 five-choice items and 6 different sections. Answers are recorded on a special answer sheet for machine scoring. Up to the end of the fiscal year 1943, eight different forms of the Aviation Cadet Qualifying Examination were released. Each new form represents an improvement over previous forms, as changes were made on the basis of accumulated research findings. The ninth and tenth forms of the examination, released recently, have been changed somewhat to allow for the inclusion of new types of materials that have been found to be of value. The type of material included in the examination and the length of each part have been adjusted so that the total score on the examination will have the highest possible validity. Because the majority of men who are accepted as Aviation Cadets are given pilot training, the examination is primarily a test of pilot aptitude.

B. Aviation Cadet Classification Tests. At the Army Air Forces Classification Centers, each cadet is given a series of approximately 20 different tests. The administration of these tests requires two days. On the first day the cadet takes various paper and pencil tests; on the second day he is examined with a number of apparatus tests.

A systematic effort has been made to develop for inclusion in the classification, battery tests for all of the skills or abilities that have been found to be important for the various aircrew duties. The types of tests that are now used can be divided arbitrarily into four general categories. Some of the tests appear to be fairly pure measures of specific abilities. Other tests appear to be more complex in nature. A general description of the different types of tests in use during 1943 up to October follows.

(1) *Tests of intelligence, judgment, and proficiency.* The classification battery included several tests of mathematical and numerical ability and a test of the ability to read and interpret technical information. In addition, certain tests were used to measure specific knowledge and information in some of the technical fields that are important for various aircrew specialties. Mechanical comprehension and mechanical information tests were included.

(2) *Tests of alertness, observation, and speed of perception.* The classification battery included tests which measured the ability to make accurate and rapid observations. These tests included questions pertaining to the perception of information contained in maps, photographs, tables, charts, and scales. All of these tests were constructed so that they contained material that was related to the perceptual problems that cadets meet in flying. Special studies were conducted concerning the scoring procedures for such tests, and the relative importance of speed and of accuracy was reflected in the use of speed and error scores.

(3) *Tests of personality, temperament, and interest.* The interests of the Aviation Cadets were assessed through the use of direct preference scales and the use of tests of information and other indications of active interests. One test was included in the classification battery that required the individual to perform a task without becoming confused, tense or unduly upset when he was faced with various distractions.

(4) *Tests of visual-motor coordination.* A number of psychomotor tests were used to test visual-motor coordination. Each cadet was examined on a separate piece of apparatus although the tests were set up in such a way that one examiner, operating a central control table, could test a group of four men. The timing of all tests and the recording of scores was effected automatically and objectively through use of a central control table. The classification battery included six different apparatus tests measuring visual-motor coordination and motor skill.

5. The Classification of Aviation Cadets

At the completion of classification testing, three scores are determined for each cadet. These are a Pilot Aptitude Score, a Bombardier Aptitude Score, and a Navigator Aptitude Score.

Each of the Aptitude Scores is determined by a procedure whereby each test is given a weight proportional to the contribution that it makes to the prediction of success in training, and an over-all weighted average of all the test scores is then obtained. Tests that do not contribute to prediction of success in a given specialty are, of course, weighted zero. Thus, for example, the Pilot Aptitude Score is determined from 10 of the 20 tests that each cadet takes, and each test that does contribute to the prediction of pilot success is given a different weight depending upon its contribution to the over-all prediction. Certain tests are weighted for more than one aircrew specialty. The manner in which this weighting procedure is actually accomplished is by recording all the scores on an aggregate weighting sheet and scoring it in an IBM test scoring machine having an aggregate weighting attachment.

Each cadet is given an opportunity to rate his interest in the different training specialties and to check one of four options that indicate whether he prefers to be classified for the training for which he has highest aptitude as indicated by the tests, or whether he wants greater consideration paid to his preference than to his aptitude ratings. On the basis of these data, the Psychological Research Unit recommends a specific type of training for each cadet. When the individual fails to meet the minimum psychological standards required for any of the three Aviation Cadet aircrew training courses, the recommendation is for enlisted aircrew or ground crew training. These recommendations are turned over to the surgeon at each classification center who has the results of a further physical examination and a standardized psychiatric interview. Final classification of Aviation Cadets is based upon the findings of the Psychological Unit and the Surgeon, and upon consideration of quota requirements. The final assignment is made by a board of officers.

The majority of Aviation Cadets prefer to become pilots. The number of men trained as pilots greatly exceeds the number trained for the other aircrew specialties so that it is possible in the majority of cases to assign men to the type of training for which

they have highest preference. The psychological aptitude scores are of special significance for the elimination of men who have very low aptitude for all types of training, and for the assignment of men who have decided differences in abilities as between the different specialties. Frequently, individuals desire to be recommended for the type of training for which they show the greatest aptitude on the psychological tests. In cases where preferences and Aptitude Scores conflict, the candidate is interviewed.

6. The Research Program

Although a major portion of the time and energy of the personnel of the Psychological Research Units in the Army Air Forces is devoted to the day-to-day routine of administering and scoring tests, maintaining records, and determining aptitude scores, it is recognized that present procedures can be improved and that extensive research is urgently needed for the continued growth and improvement of the program. The types of research problems which arise in the testing program and the general responsibilities and policies for conducting research are described in the following sections. These sections describe the program as it has developed up to October 1943.

A. Analysis of duties and functions. The research program involves first of all continuing studies of the duties involved in all the different aircrew assignments and of the conditions under which they must be performed. These job analyses are a necessary first step in analyzing the psychological functions involved in the different aircrew positions. Studies of the conditions of combat aviation are particularly important at this time. From an analysis of the psychological functions involved in operational and combat flying there are developed hypotheses as to the types of tests which should be significant in selecting men for combat.

Research in connection with job analyses has been carried on at all of the units concerned with the Air Forces testing program. Major responsibility for carrying on this work was assigned to the Field Studies Unit, Psychological Section, Research Division, Office of the Surgeon, Headquarters Training Command.

B. Modification or invention of testing procedures. As revised schedules of behavioral characteristics to be tested are set up, the research effort of the staff turns to the modification or invention of testing procedures which will give an objective evaluation of

those characteristics. Test ideas are welcomed, and do come from all the units—both from officers and enlisted personnel. However, in order to guarantee coverage of different aspects of behavior and to minimize overlapping, each unit was assigned primary responsibility for conceiving and developing tests of certain aspects of human behavior. The Psychological Branch, Office of the Air Surgeon, Headquarters Army Air Forces directed, supervised and coordinated this research. The assignment of responsibility was as follows:

Tests of personality, temperament, and interest
Psychological Research Unit #1, Air Force Classification Center, Nashville, Tennessee
Tests of coordination and visual-motor skill
Responsibility for research and validation:
Psychological Research Unit #2, Air Force Classification Center, San Antonio Aviation Cadet Center, San Antonio, Texas
Responsibility for research including design, procurement, and construction of apparatus:
Department of Psychology, Research Section, School of Aviation Medicine, Randolph Field, Texas
Tests of intelligence, judgment, and proficiency
Psychological Research Unit #3, Air Force Classification Center, Santa Ana Army Air Base, Santa Ana, California
Tests of alertness, observation, and perceptual speed
Psychological Section, Office of the Surgeon, Headquarters, Army Air Forces Training Command, Fort Worth, Texas
Aviation Cadet Qualifying Examination
Psychological Branch, Research Division, Office of the Air Surgeon, Headquarters, Army Air Forces, Washington, D. C.

C. Refinement and improvement of tests. From a clever test idea to a usable and validated test is a long and tedious road. Much of the research effort of the psychological organization is devoted to preparing test items, designing apparatus, trying out embryonic test forms on an experimental basis, revising and redesigning, gathering data for item analyses, determining reliabilities, and all the other routines of test construction which are involved in making a workmanlike and efficient test. Responsibility for this further development is assigned to those same units which have responsibility for originating the tests. Approximately 200 tests have been tried out experimentally thus far in the research program. Many of these were developed by personnel within the psychological program; others were modified to meet the needs of this organization.

D. Validation of tests. The final proof of the testing procedures which are being developed is, of course, their validity in terms of an adequate criterion of success. As is usual in practical testing problems, validation presents a difficult problem. The difficulty is in part due to the time that must elapse between testing and comparison of test scores with proficiency ratings after many months of training. Eventually, rather satisfactory data against which to validate test scores become available in the form of records of success or failure in training and of achievement in specific operational tasks. However, this information is not available until many months after the time candidates are tested for classification purposes. With the urgent need to improve selection and classification procedures as rapidly as possible, this lag represents a major problem in the improvement of the testing program.

E. Determination of efficient test batteries. In addition to the validities of individual tests, intercorrelations must be computed. From these, the best combination of tests may be determined and regression equations may be obtained for maximum prediction of success in the various aircrew positions.

Statistical analyses in connection with validation and with the determination of intercorrelations have been assigned to the Psychological Section, Office of the Surgeon, Headquarters, Army Air Forces Training Command.

7. Modifications of the Selection and Classification Procedures

As indicated previously, both the Qualifying Examination and the tests in the classification battery are subject to modification and revision in the light of results obtained. Additional tests may also be added to the battery as job analyses of operational flying and further research indicate new aspects of behavior to be tested. For example, the Qualifying Examination has recently been altered in the direction of including a speeded section involving problems related to the perceptual judgments important in flying. The apparatus tests are also modified and altered in the direction of increasing the prediction of aircrew performance. For example, research is underway at the present time on the addition of distracting and disturbing stimuli to certain of the psychomotor tests with a view to making the tests "stress" situations. New types of tests are being developed. For example, a number of moving picture tests have been tried out.

The procedures for recommending applicants for the various types of training are also examined regularly as additional evidence becomes available. Thus the standards of acceptance for pilot, bombardier, and navigator have recently been raised as validation data indicated that such a change was desirable.

Continual revision and refinement has increased the predictive capacity of the classification battery and of the Qualifying Examination to a considerable extent. At the present time, the degree of success obtained in predicting achievement in the various aircrew positions is as good as the best predictions that can be made of academic success in the colleges and universities of this country.

The above statement describes the psychological program as it operated during 1942 and most of 1943. At the present time a number of changes are being made in line with general War Department policy and in the interests of efficiency of operations and procedures. The various operating functions performed in the Psychological Branch in Headquarters, Army Air Forces are being transferred to the field units. The Psychological Branch in Washington will in the future be concerned chiefly with policy making, liaison, and general supervision of the program. The construction of the Aviation Cadet Qualifying Examination and the direct supervision of test development and the analysis of validation data has been delegated to the Training Command.

Another major change which is being made is to transfer the classification testing to the basic training centers. In the future all men going to the colleges from the basic training centers will have taken the complete battery of classification tests and have been found qualified for either bombardier, navigator, or pilot training. This involves the establishment of seven new psychological units. A Psychological Research Detachment (Gunnery) has also been activated, bringing the total number of units in the Training Command to eleven. The present directors and locations of these psychological units are as follows:

Major William M. Lepley
Army Air Forces Classification Center
Nashville, Tennessee

Captain Meredith P. Crawford
Army Air Forces Classification Center
San Antonio, Texas

Captain Neil D. Warren
Army Air Forces Classification Center
Santa Ana, California

Major Anthony C. Tucker
Army Air Forces Basic Training Center
Miami Beach, Florida

Captain Philip H. DuBois
Army Air Forces Basic Training Center
Jefferson Barracks, Missouri

Major Lewis B. Ward
Army Air Forces Basic Training Center
Greensboro, North Carolina

Captain William E. Walton
Army Air Forces Basic Training Center
Amarillo, Texas

Captain Clarence W. Brown
Army Air Forces Basic Training Center
Buckley Field, Denver, Colorado

Major Frederic Wickert
Army Air Forces Basic Training Center
Keesler Field, Biloxi, Mississippi

Major Merrill F. Roff
Army Air Forces Basic Training Center
Sheppard Field, Wichita Falls, Texas

Captain Nicholas Hobbs
Central Flexible Gunnery Instructors School
Buckingham Army Air Base, Fort Myers, Florida

Very recently Lieutenant Colonel Laurance F. Shaffer has been transferred to the Headquarters of the Redistribution Center, Atlantic City, New Jersey, to develop plans for psychological testing in connection with this program. It is proposed that a psychological research program be initiated at the Redistribution Center. This program involves proposals for testing and research on problems of selection and classification of air crew for combat duty, and investigation of the fitness of men returned from combat duty for additional service.

Present policy calls for increasing use of Aviation Psychologists in research on problems of training and on problems of later classification for special duty assignments.

As indicated previously, later articles in this series deal with the problems and procedures of specific research areas.

A PROGRAM FOR THE CLASSIFICATION AND TRAINING OF RETARDED SOLDIERS

BY LOUIS L. McQUITTY,* LT. COL., AGD
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The purpose of this paper is to outline the etiology, present status, and expected future development of a program of classification and training of retarded soldiers in effect as of July, 1943, at the Engineer Replacement Training Center, Fort Belvoir, Virginia.

Need for the Program

A very informal and unscheduled program of classification and training of retarded soldiers began shortly after the opening of the Center. The retarded soldiers sooner or later classified themselves by their inability to maintain the pace set by the other soldiers, and the instructors developed individual training techniques which they hoped would help bring the retarded up to the standard of the others. In an effort to achieve this goal, some of the instructors gave a disproportionate share of their time to individuals who, in general, were least qualified to profit from the extra instruction, and many of the techniques applied by the instructors were not the most effective. It soon became evident that both the retarded soldiers and the other soldiers would profit by an independent program for the retarded.

Etiology of the Training Program

The present training program for the retarded soldier passed through several stages of development. The initial stage involved gathering together into one company of approximately 200 men all of those trainees who had not been transferred out of the Center at the end of their training course, because they had been found to be unqualified in some way. The group included mental defectives such as feebleminded, psychopaths, psychotics, drug addicts, and physical defectives. This program was not entirely satisfactory. The company to which the retarded soldiers were assigned was one of a four-company battalion, and the morale and efficiency of the other three companies fell rather rapidly. It appeared that the composition of the company under discussion was a principal factor.

* On leave of absence from the Department of Psychology, University of Illinois.

The program was readjusted so that each of ten battalions was supposed to provide the specialized training for its retarded soldiers. This procedure was based on the theory that the morale of no battalion would suffer if each were alike and had to solve its own problems. This solution was found defective in at least two ways. The retarded, as a small group within a battalion, were made to feel too pointedly their deficiencies, and their morale was very low. Dispersal of the retarded throughout the Center, inherent in this program, made it difficult to achieve unified training for the men.

A better solution was found when barracks space became available for the group in an isolated company area several miles from the Center proper. The retarded soldiers have learned to regard this area as their own. Police is at a very high standard, and the men take a great deal of pride in their organization. Their morale is high. Many of the men transferred to this company soon find relief from their discouragement which was caused by competition beyond their abilities.

The first training program put in effect for this company assumed that all of the men should take approximately the same training. Experience soon proved to those concerned that there are wide ranges of individual differences even among the retarded. This is especially so in this case where the term *retarded* is applied to individuals who for any reason could not progress satisfactorily in the regular training program. It began to appear that there should be a program for each individual. A limiting factor in this respect was the available number of instructors. The next best effort appeared to be to divide the group into a number of homogeneous sub-groups and develop courses of instruction for the sub-groups. In line with this principle, the following courses were developed.

1. *Elementary educational, military, and army engineering subjects.* This course is for illiterates and non-English speaking or writing soldiers. The illiterates and the non-English are under different instructors, and the educational subject matter is adapted to the respective needs of the two classes. The military and engineering subject matter is approximately the same, but is presented by the respective instructors in such a way as to adapt it to their classes.

Plans have been under consideration to include a mental therapy class. The class would have included maladjusted individuals who it was felt could be improved by group therapy. The class would have taken the same military and engineering subject matter as the two just mentioned classes, but would not have taken the educational subject matter. The

instructional time thus available would have been utilized in an effort to relieve the individuals of over-concern about their problems by attempting to interest them in the war through stories of war heroes, war atrocities, sufferings and the opportunities for service. Deterrents to the development of this class included scepticism as to its possible fruitfulness and the lack of qualified instructional personnel.

2. *Physical coordination and elementary military subjects.* This course is for those soldiers of low grade mentality who are particularly deficient in the ability to coordinate their muscular movements.

3. *Individual attention or observational course.* Soldiers about whom it is very questionable as to whether or not they can be developed into useful soldiers in a reasonable interval of time are transferred to this course, where they are given the advantage of more individual attention, in an effort to develop them so they can be of some usefulness. Despite this effort, the majority of these can not be so developed and are accordingly discharged.

The separation of these soldiers from the others for training has another advantage in that discharges require certain prerequisite administrative procedures. These are initiated when the soldiers are transferred into the course, so that they can be completed within a minimal time if discharge should be determined as the appropriate action.

The purpose of the above outlined three courses is to qualify as many retarded soldiers as possible for regular training and to determine as early as possible those who cannot be so qualified. All training is so scheduled as to make for frequent reviews. Every effort is made to teach by having the men do the thing being taught. All instruction is supposed to be on the concrete, objective level as contrasted with the abstract. Many training aids have been developed and are being utilized. A deterrent to the complete realization of some of these principles is the inability to obtain and retain qualified instructors. Individuals with the appropriate educational and experiential backgrounds are scarce among engineer soldiers, and those enlisted men who are qualified for instructors are usually of such a quality as to be approved for officer candidate schools. Qualified engineer officers, when found, usually advance to bigger assignments.

Etiology of the Classification Program

Helpful to any differential training program is a successful classification program. The present classification program for the retarded soldier developed gradually as did the training program. The classification problem was first realized as some of the soldiers fell behind in their training. Some of them, however, finished the regular training program before reports reached the Center Head-

quarters that they were not qualified for transfer to field units as trained replacements. They were held for additional study and training. Psychological and psychiatric officers were directed to study them. Some of the soldiers were discharged while others were given further training and transferred out to field units as replacements.

The studies revealed that many of the men had records in civilian life corresponding closely to their military records and suggested that the men could have been appropriately classified much earlier in the regular training program. The first attempt in this direction was to have soldiers who appeared to be retarded, in their first few days of training, appear before a board of officers. In searching for such men, particular attention was given to all who made low scores on the Army general learning ability test. The training instructors who selected men to appear before the board also furnished their reasons for the selections. Psychiatric and psychological officers, as well as troop officers, were on the board and appeared before the board as witnesses. The board procedure often demonstrated that the psychological and psychiatric officers had techniques and methods which enable them to arrive rapidly at what appeared to be valid judgments. Gradually the duties of the board were turned over to these specialized officers. The specialized officers developed a mental hygiene unit of psychiatric officer, psychological officer, psychiatric social worker and trained interviewers to carry on the duties previously accomplished by the board.

The Consultation Service

Considerable thought was given to the development of the mental hygiene unit with the hope that it could so function and be so interwoven within other units of the Center that no derogatory terms, or stigma, would develop concerning it. In line with this effort, it was decided to call the unit the "Consultation Service," this being chosen as a name which carries no derogatory implication but which still carries a true descriptive implication of the function of the unit. The unit was made an integral part of the Enlisted Division of the Center Headquarters.

The Enlisted Division is responsible for all the personnel administration, classification, and assignment of enlisted men of the Center. It is composed of nine principal sections, as follows: Pay Roll, Service Records, Special Problems (including duties in reference to furloughs, courts-martial, sale of bonds, dependency allotments, and sale of National

Service Life Insurance), Classification, Specialist Assignments, Consultation Service, Arrival of Troops, Special Order and Company Assignments, and Departure of Troops. In addition, a Dental Liaison Officer and a Chief of Dispensaries, or Medical Liaison Officer, both under the command of the Post Surgeon rather than the Replacement Training Center Commander, function at the Center in close cooperation with the sections of the Enlisted Division.

This organization ties the Consultation Service in closely with those other functions with which its duties are closely associated, facilitates cooperation, and encourages the Consultation Service to be accepted in the same manner as the other already established sections.

The internal organization of the Consultation Service requires dual responsibilities and qualifications of the psychologist. He is responsible for the proper psychological study of cases referred and the necessary army administrative procedure to effect the action found by the studies to be appropriate. He must qualify as an army administrator and as a personnel psychologist. The psychologist's worth is often judged by his army administrative ability rather than his psychological achievements. The psychologist should at least equal his administrative colleagues in the performance of administrative duties. If he does this, and usually only if he does this, his knowledge of psychology will enable him to be considered more valuable than his administrative colleagues.

The above points concerning the dual qualifications of the psychologist in the Consultation Service seem to suggest the possibility that psychology would be of much greater demand in similar situations in industry if our educational system trained students to be personnel managers, advertising specialists, production engineers and other like specialists, as it now does, and in addition gave them a thorough knowledge of psychology. This approach would probably produce students with qualifications and evaluations of their industrial responsibilities very similar to those which industry expects of young men employed as industrial psychologists. It would minimize the necessity of readjusting responsibilities and making up deficiencies in qualification now experienced by industrial psychologists who were trained principally by virtue of learning all the psychological aspects of industry. The young industrial psychologist might then be of more immediate value to industry and consequently in much greater demand.

The psychologist of the Consultation Service serves as a clearing house for all cases; he either takes final action on the basis of his own study or refers the case first to the psychiatrist for recommendations and then takes final action. Advantages inherent in

this plan of functioning are that one professional specialist is so trained as to facilitate putting professional recommendations into practice; while the other specialist, the psychiatrist, is left free to give practically all of his time to his professional duties.

Other advantages arise from the organization of the Consultation Service. These derive from the fact that the psychiatrist is on the staff of the Commanding General of the Center, rather than on the staff of the Post Surgeon. One of the advantages has to do with the fact that many cases appropriate to see the psychiatrist are out-patients and do not require hospitalization. Their appointments with the psychiatrist can be readily coordinated with the training program by the staff of the Commanding General of the Center; while such is difficult for the staff of the Surgeon, unless, of course, they clear through the staff of the Commanding General of the Center, thus causing more administrative work. The greater efficiency in coordinating the appointments with the training program encourages greater cooperation from the troop officers in making referrals.

Another advantage has to do with the fact that experience at the Center seems to indicate very strongly that the troop officers are more proficient in referring appropriate cases to the psychiatrist than are the hospital medical officers. The troop officers are in a much better position than the medical officers to observe the behavior on which the appropriateness of a referral must be based, as the troop officers and their noncommissioned officers come into daily contact, often under strenuous conditions, with the men. This suspected condition of greater efficiency on the part of the troop officers was a factor which motivated the development of the Consultation Service, where a psychiatrist would be available for referrals direct from the troop officers without the necessity of referring them first to a general medical officer. Another factor which motivated the development of the Consultation Service was the desirability of having a psychiatrist readily available so that he could lecture to the officers of the Center and hold informal talks with them, thereby improving their efficiency in referring appropriate cases.

The Surgeon General of the Army was favorably impressed by the way in which a psychiatric service had been interwoven into the personnel, classification, and assignment functions of the Center. He consequently made provisions whereby the Commanding Generals of other replacement training centers were offered the

opportunity to request psychiatrists on their staffs. Those requested are routinely placed on temporary duty at this Center to become acquainted with the organization and functioning of the Consultation Service before moving to their permanent assignments. Up to the present, fifteen psychiatrists have taken this temporary and informal training in the Consultation Service of the Center.

Soldiers are referred to the Consultation Service by training instructors, the military courts, the Provost Marshal, medical officers, Red Cross workers, and Chaplains. By far the majority are referred by the training instructors, and the majority of these are referred during the first ten days of training. It is the responsibility of all training instructors to observe and study very carefully all their men during this period, and especially those who made low scores on the general learning ability test, with a view to recommending for special development training all those who will profit by it and all of those who will not be of usefulness to the Service unless they do profit. Other appropriate cases which are not spotted during the first ten days are recommended for consultation whenever discovered. Included among these latter cases are drug addicts, constitutional psychopaths, those with abnormal reactions to some phase of training such as firing or demolitions, epileptics, disciplinary cases, and others who do not usually reveal their symptomatic traits until after the first ten days of training.

Each military court, after it officially closes a case, recommends whether or not the soldier should be referred to the Consultation Service. The convening authority of the court studies the report of the case and also recommends whether or not the soldier should be referred. All those recommended for consultation by either the court or the convening authority are seen, as well as some not so recommended if a review of the latter cases by the psychologist seems to indicate such to be desirable. After the soldier has been studied by the Consultation Service, the convening authority may readjust the sentence in the light of the report and recommendations of the Consultation Service.

A routine referral to the Consultation Service passes through the following steps:

1. An individual intelligence test.
2. An interview, covering (a) Educational achievements and rate of progress; (b) Occupational history and economic achievements; (c) Social adjustment; (d) interests; (e) Army adjustment; (f) General knowledge; and (g) Abilities.

3. Recommendations by the interviewer as to appropriate action.
4. A review by the psychological officer of the records accumulated in the above process; a re-interview by him if desirable; and a referral to the psychiatric officer for further study and final recommendations, if appropriate.

If the soldier is referred with the suggestion that he take special development training, the recommendation of the psychiatrist always includes a statement as to whether or not such training should be given.

In the case of soldiers suspected of questionable mental health, or who appear to be appropriate for discharge, referral is usually made to the Red Cross social psychiatric case worker who obtains a case history through Red Cross channels before final disposition.

Some of the soldiers have records of recent military misdemeanors. In these cases the psychiatrist makes one of the following findings:

1. Soldier is fully responsible for his behavior.
2. Soldier is not responsible for his behavior.
3. Soldier is responsible with the following mitigating conditions _____ and will or will not profit by punishment.

The policy is to punish those fully responsible, not to punish those not responsible, and to let the expected influence on other soldiers be the determining factor in the cases where the soldiers are responsible with mitigating circumstances and not expected to profit by punishment. If they are expected to profit by punishment, they are punished.

Some of the soldiers are returned to regular training, and others are transferred to special development training. In any case, suspenses are kept to assure return at the assigned time for further study, whenever such is appropriate.

The soldiers transferred to special development training are carefully observed and studied by their instructors who are required to keep records of just what the soldiers achieve or fail to achieve in their training. Near the end of each special development training course, the instructors recommend one of the following dispositions for each of their men: (a) discharge; (b) return to regular training; or (c) transfer to another course in special development training for improvement of other deficiencies.

The recommendations are reviewed by the psychological officer. At his discretion he re-interviews, approves, readjusts the recommendation, or refers the case to the psychiatric officer for a de-

cision. The psychiatric officer has the same three above-listed alternatives for disposition of each case referred.

Discharge proceedings are considered appropriate if it is felt that the soldier can be of no usefulness to the Service. This is assumed to be true just as soon as evidence reveals a history of, predisposition toward, or diagnosis of psychoneurosis, mental deficiency, epilepsy, constitutional psychopathic state, or psychosis. It is also found to be true in other cases which do not fit any formal category. Discharge proceedings are not decided as appropriate in these latter cases until attempts at special development training have indicated strongly that the soldier cannot be made useful to the Service.

The usual discharge procedure requires a board of at least three officers. They review the reports of the psychological officer, psychiatric officer, social psychiatric worker and instructors and may interrogate any of these as well as the soldier. The interrogation makes maximum use of questions designed to derive objective descriptions of behavior rather than interpretations or opinions by the witnesses and thus reduces the amount of conflicting evidence. The purpose is to give the board as complete a picture as possible, within the available time, of the behavior of the soldier which is closely related to the decision which it must make. This plan of interrogating the witnesses has proved so helpful in saving time, avoiding conflicting evidence, and facilitating decisions that a standardized group of questions has been prepared and is being utilized.

The board may recommend approval or disapproval of the discharge to the Commanding General, who is the final authority. If the discharge is disapproved, it may be recommended again after further training and study, or the soldier may be returned to regular training along with all others not discharged. He, as the others, may eventually graduate from regular training and thus be made ready to go forward as a trained replacement and do his part toward bringing this war to an early and successful end.

Future of the Programs

As this paper is being written, a plan is being completed for transferring some of the responsibility for special development training from Replacement Training Centers to Reception Centers. The plan includes special development training for all men scoring grade V, approximately the lowest seven percent, on the general

learning ability test. This is the group from which many of the candidates for the training come, and all of them will probably derive definite benefit from it. This plan avoids the necessity of starting all cases in regular training in order to determine which are going to do so poorly as to necessitate giving them the first priority in the limited facilities available at Replacement Training Centers for special development training. The new plan means that the individuals of low intelligence will arrive at Replacement Training Centers only after they have graduated from special development training. This should do much to enhance their chances of a successful adaptation and for this reason alone should prove superior to the present program.

Summary

This paper shows how an instructional program for retarded individuals, and a mental hygiene program, both similar to those which are today found in many modern educational systems, developed in a Training Center of the Army. They developed as the execution of the regular training program demonstrated wide individual differences and as psychological and psychiatric officers made known special techniques and methods of handling these differences.

In developing the mental hygiene program, particular care was taken to tie it in closely with other personnel functions and to keep the psychologist well informed on army administration in order to prevent conspicuousness and false evaluations of the program. The efforts in this direction and the resultant high cooperation between this program and other functions of the Training Center have been so successful that the program is serving as a standard for the establishment of similar programs in many other training centers.

THE ARMY SPECIALIZED TRAINING PROGRAM COURSE IN PERSONNEL PSYCHOLOGY

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For the first time in history eleven departments of psychology are now giving the same series of courses, using the same subject matter outlines, to similarly selected groups of students all working toward the same objective. The courses are those included in the Personnel Psychology curriculum under the Army Specialized Training Program. The students are soldiers selected for training as personnel technicians in the Army of the United States.

During the fall of 1942 plans were made by the War Department to establish an Army Specialized Training Program early in 1943. In anticipation of this program, the Emergency Committee in Psychology of the National Research Council asked Dr. Walter Hunter to survey the existing supply of professionally trained psychologists and to collect estimates from the several branches of the federal government on the prospective 1943 demand for psychologists. A brief account (1) of Professor Hunter's findings showed a total supply of from 3,400 to 4,000 of whom about 25% were already serving as psychologists in the Army, the Navy, and civilian government agencies. In view of the prospective exhaustion of the civilian supply of psychologists (many of the remaining 75% were not suitable for military service because of age, sex, health, or other duties), psychology was included as one of the advanced courses under the Army Specialized Training Program (2).

The Army Specialized Training Division appointed a committee consisting of Walter Hunter; Major Karl M. Dallenbach, Office of the Adjutant General; L. L. Thurstone, Expert Consultant to the Secretary of War; and Leonard Carmichael, chairman of the Division of Anthropology and Psychology of the National Research Council, to outline a curriculum for a course in Personnel Psychology to last for two terms of 12 weeks each. The course was not intended to make professional psychologists of the men in that time, but was intended to convert carefully

selected soldiers who had had at least three courses in psychology and some work in college mathematics into acceptable personnel technicians.

The program adopted calls for 29 class hours of work per week throughout both terms. In addition to the academic work, the men are given 5 hours of military classes, 6 hours of physical exercise and 18 hours of supervised study each week—a program totalling 58 hours a week.

The courses covered in each term, the total weekly hours required and the recommended distribution between class and laboratory time, and a brief indication of the content of each course in the program are printed below.

First Term

Course	*Required Total hrs./wk.*	*Recommended hrs./wk. Class*	*Lab.*
STATISTICS (Tabulation, graphical methods, measures of central tendency and dispersion, standard scores, reliability, errors of estimation, correlation.)	9	4	5
TESTS AND MEASUREMENTS (The logic of measurement, psychophysical methods and their relation to measurement, history of measuring techniques, construction and use of various kinds of tests.)	9	4	5
OCCUPATIONS AND VOCATIONAL PSYCHOLOGY (Occupational groups, families, hierarchies, distributions and trends, relations between military and civilian jobs, study of representative jobs, the Dictionary of Occupational Titles, and army regulations on classification and assignment.)	9	4	5
SOCIAL PSYCHOLOGY (Attitudes, leadership, morale, public opinion, propaganda.)	2	2	0

SECOND TERM

Course	Required Total hrs./wk.	Recommended hrs./wk. Class	Lab.
WORK, FATIGUE, AND EFFICIENCY (Fatigue and monotony, motor driving problems, accident prevention, industrial relations, efficiency.)	4	4	0
NORMAL AND ABNORMAL PERSONALITY (Psychological theories of personality, diagnosis, measurement, symptoms of mental disease, personality defects.)	2	2	0
PERSONNEL METHODS (Administrative personnel problems, job analysis and job specification, record keeping, time study.)	5	2	3
LEARNING AND PERCEPTION (Learning, conditioning, transfer of training, vision, hearing, organic sensitivity, acuity, camouflage, sound localization, perception.)	9	4	5
TESTS AND MEASUREMENTS: INTERVIEW METHODS (Continuation of tests and measurements course from 1st term with emphasis on interviewing methods.)	9	2	7

Groups of men for this training have been assigned to eleven schools. According to present plans, no additional groups will be started, either at these or at other schools. The schools, the number of men assigned to each, and the names of members of the faculty giving instruction in one or more of the courses are listed below arranged according to starting dates.

MAY 10, 1943

UNIVERSITY OF PENNSYLVANIA: Robert Brotemarkle, *Director;* 123 men. *Instructors:* F. P. Bakes, H. K. Brobst, R. A. Brotemarkle, J. C. Diggory, R. S. Driver, W. E. Fisher, F. W. Irwin, M. S. Murphy, M. G. Preston, R. C. Rogers, A. S. Thompson, and M. S. Viteles.

UNIVERSITY OF CHICAGO: Dael Wolfle, *Director;* 134 men. *Instructors:* A. W. Brown, J. B. Carroll, M. H. Groves, W. E. Henry, A. S. Householder, F. A. Kingsbury, L. Phillips, W. B. Stephens, F. Swineford, L. R. Tucker and D. L. Wolfle.

May 17, 1943

Stanford University: Paul Farnsworth, *Director;* 109 men. *Instructors:* R. G. Barker, G. E. Brown, Jr., R. K. Campbell, P. R. Farnsworth, M. M. James, R. F. Jarrett, G. A. Magaret, P. Mussen, G. Nettler, A. C. Sherriffs, C. P. Stone, E. K. Strong, Jr., C. E. Stuart, and R. C. Travis.

June 14, 1943

Cornell University: H. P. Weld, *Director;* 151 men. *Instructors (first term only)*: T. L. Bayne, M. E. Bitterman, J. Cohen, G. H. Smith, H. Palmer, T. A. Ryan, R. K. White, and A. L. Winsor.

Harvard University: Carroll C. Pratt, *Director;* 126 men. *Instructors:* G. W. Allport, J. G. Beebe-Center, R. B. Cattell, R. Dennett, S. G. Estes, E. A. Haggard, T. M. Harris, D. Horn, T. L. Kelley, C. R. Langmuir, R. H. Mathewson, G. A. Miller, O. H. Mowrer, C. C. Pratt, A. W. Purvis, D. C. Randall, D. W. Taylor, K. S. Wagoner, R. A. Waite, N. Y. Wessell, and R. W. White.

The Ohio State University: H. E. Burtt, *Director;* 122 men. *Instructors (first term only)*: H. E. Burtt, F. C. Dockeray, H. B. English, C. Evans, R. P. Fischer, L. Hadley, J. Kinsella, F. N. Maxfield, R. Mooney, F. P. Robinson, H. A. Toops, and A. M. Wellington.

University of California: Warner Brown, *Director;* 97 men. *Instructors:* O. L. Bridgman, W. Brown, E. Brunswik, R. H. Gundlach, J. R. Hamilton, H. H. Kelley, M. Levin, J. Loevinger, J. W. Macfarlane, R. N. Sanford, E. C. Tolman, and W. M. Wickham.

University of Pittsburgh: J. Stanley Gray, *Director;* 121 men. *Instructors:* P. A. Brown, A. G. Dietze, L. M. Douglas, W. Garrett, O. E. Graebner, J. S. Gray, W. R. Grove, J. W. Harbaugh, G. E. Jones, J. S. Kinder, R. A. Patton, and W. Willis.

July 12, 1943

Purdue University: Joseph Tiffin, *Director;* 126 men. *Instructors (first term only)*: E. J. Asher, D. C. Beier, I. B. Kelley, C. H. Lawshe, H. E. O'Shea, H. H. Remmers, G. A. Satter, W. R. Thompson, G. R. Thornton, J. Tiffin, and H. J. Vasconelles.

University of Minnesota: H. P. Longstaff, *Director;* 130 men. *Instructors (first term only)*: J. E. Anderson, S. E. Baden, C. Bird, A. H. Brayfield, W. W. Cook, O. Cross, L. R. Harmon, D. B. Harris, W. T. Heron, H. P. Longstaff, K. MacCorquodale, D. G. Paterson, H. F. Roth, W. Schofield, I. Simos, and C. E. Stacey.

August 9, 1943

State University of Iowa: Kenneth W. Spence, *Director;* 120 men. *Instructors (first term only)*: A. D. Annis, G. R. Bach, P. Blommers, C. E. Buxton, L. Festinger, C. d'A. Gerken, H. H. Kendler, N. C. Meier, H. V. Meredith, K. W. Spence, C. R. Strother, and J. B. Stroud.

The total number of men originally assigned to the eleven schools was approximately 1,350. Some of these have already

been dropped for academic failure or other reasons; others will be. It is quite specifically intended that the men be made to work hard and that the unsuccessful ones be eliminated. As an estimate, perhaps 1,000 men will receive certificates showing satisfactory completion of the program.

The quality of men selected for training was variable but generally excellent. Standards for selection were given to the STAR centers (Army installations which make the final selection of men for all ASTP courses) in terms of minimum Army General Classification Test (AGCT) score and previous college training in psychology and mathematics. As one example, nearly two-thirds of the men assigned to the University of Chicago were college graduates. The entire group averaged 134 on the AGCT. This score is 1.7 S.D. above the Army average. Even so, over 70 of the 134 men did not meet the technical requirements of three previous courses in psychology and one year of college mathematics. In most cases groups assigned to schools starting at later dates were more carefully selected than the men sent to Chicago. In some of these schools over three-fourths of the men were college graduates; for some the minimum AGCT score was 130. All of the Directors with whom I have talked have commented on the high average ability of the groups assigned to them.

On September 3, 1943 a one-day conference of directors and teachers of the program was held at the University of Chicago. The conference was attended by J. E. Anderson, University of Minnesota: C. E. Buxton, and K. W. Spence, State University of Iowa; C. Rogers, Ohio State University; J. S. Gray, University of Pittsburgh; J. B. Carroll, W. B. Stephens, L. R. Tucker, and D. L. Wolfle, University of Chicago; and E. R. Guthrie and D. G. Marquis of the A.P.A. Committee on the Graduate and Professional Training of Psychologists. The day was spent in discussing details of the program, methods and projects found effective in the different classes, and lessons which the instructors might learn from experience with the Army groups which should be applied to the teaching of regular classes.

The principal feature of the ASTP courses which most instructors wished to retain for regular classes was the rather large amount of class time spent in laboratory or supervised work periods in such subjects as statistics or tests and measurements. For both courses, the Army program called for four class and five laboratory hours a week. The instructors agreed that this schedule

resulted in a more thorough mastery of the material than does the usual individual study method and that the superiority was great enough to justify the added expense of conducting the extra supervised hours. The advantage of this method of instruction is one of the things most frequently commented on by the soldiers in the class at Chicago. In view of this agreement, the men present at the September 3 conference recommend the inclusion of work periods or periods of supervised study as part of the regularly scheduled program of courses such as statistics or tests and measurements.

A second point of agreement at the conference was the desirability of giving wider circulation to teaching materials and projects in psychology. A number of the projects described at the meeting by a man from one school are being or are going to be used at other schools. It was decided to request the director at each school to distribute copies of all available teaching materials to each of the other schools. In this way some of the particularly successful projects will become more widely useful both now and later. A policy of exchanging teaching materials somewhat as we now exchange reprints of articles could well be continued after the war.

An unfortunate feature of the program regularly commented upon whenever instructors get together from different schools is the large amount of overlapping between courses. The individual course outlines appear logical and consistent but overlap between courses becomes very obvious both to students and instructors when all students are taking the same set of closely related courses all at the same time. This overlap has been deleted from the sketchy outlines printed above, but in a number of cases it was unnecessarily great. The topic "morale" was listed in three separate courses; "tests and selection methods" was included in five of the courses. Most of the schools have minimized this overlap by various rearrangements of topics. In rearranging, however, the prescribed topics have been retained so that the work covered in one school is essentially the same as that in another. Such overlap also, of course, characterizes many civilian course outlines. In both cases it merely reflects our professional uncertainty and disagreement over the proper organization and classification of psychological content.

Several of the eleven schools have arranged to give college credit now for the work done in the course. Others plan to provide for such credit later where it is wanted through the offices of the

Armed Forces Institute. In view of the accelerated pace of the program, the amount of credit being given is greater than that earned by the average college student in an equal number of months.

It is hoped that the teaching of psychology will derive some lasting benefits from the experience with this course. By the time the last man graduates next February approximately 150 teachers will have participated in the program. Their experience with a course which differs in a number of respects both in method and in content from our traditional courses, the necessity of eliminating undesirable overlap in material, and the inevitable critical examination of psychological ideas, methods, and organization should result not only in the training of men for the Army, but also in the improvement of our civilian training of personnel technicians.

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THE INTRODUCTORY COURSE AND MILITARY PSYCHOLOGY

BY NORMAN C. MEIER
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The probability of the war's continuance in Europe into 1944 and indefinitely in the Far East sector argues for a reasonable adjustment of the college curriculum to fit the needs of students who will actually be in classrooms during the period. With few graduates, a reduced number of upperclassmen, and sophomores facing an early curtailment of their academic progress the chief need for adjustment would seem to be at this lower level. Adjustment may take any one or all of these directions:

1. Revision of the content of the Introductory Course.
2. Liberalizing of prerequisites and sequence requirements, making more courses available to sophomores.
3. Introduction of special wartime courses.

Revision of the elementary Course was proposed recently by Smith (**12**) and by a Committee on Psychology for the U. S. Office of Education (**6**). The latter proposes two types of course, one presenting general principles with applications and illustrative content having wartime reference, and one organized as a series of problems featuring motivation, morale, attitudes, propaganda, personnel problems, conflict, strain, adjustment and leadership. The recommendations are sufficiently flexible to permit some degree of modification. Other suggestions for revision of the Introductory Course have recently been made also by Ruja (**11**) and Wolfle (**13**), but these two, however, were advanced more with reference to normal times. At Iowa the plan has been adopted of revising the Introductory Course somewhat along the lines of the U.S.O.E. report but with a somewhat different envisagement of the problem. Inasmuch as the wartime revision touches upon all three of the above directions which adjustment may take the program may be of interest to *Bulletin* readers.

Considering the academic needs of women, men subject to early induction, Basic Course ROTC, and miscellaneous others, the Introductory Course, heretofore an indivisible two-semester 6-hour course, was changed to a one-semester course with four options for the second semester: advanced general, educational (for teacher training chiefly), social, and psychology of adjustment. In addition there is continued from last year the course in Military Psychology, repeated each semester, and *requiring no*

prerequisite. In the summer semester a 2-hour course is offered in Problems of Military Personnel. There is hence now made available for the student anticipating early induction (which *may* be postponed to end of academic term or year) four or five courses which may help him in OCS or specialist duties later. As military psychology is an innovation in American colleges, some observations on its nature are in order.

In view of the growing body of literature the organization of a course in military psychology now offers few of the difficulties met with a year ago. The experience of the Departments as at Illinois and Iowa can now be relied upon; also, material such as the earlier outline of Pennington and Case (**9**) which has now been enlarged upon as a text (**10**); and a new text recently published (**8**). The hand-book, "Psychology for the Fighting Man" (**2, 3, 14**) is useful as will also be the more extensive text to be prepared by Boring's Committee (**2, 3**). There are also the informative *Bulletin* articles published during the past months in the *Psychology and the War* section (**1, 4, 5, 7, 15**). The various approaches are different in nature, tending to supplement each other, and reflect the different training, background, interests and experience of the authors. The Illinois course featured learning with less treatment given other phases, such as personnel, leadership, and adjustment. Since the Iowa development was somewhat differently oriented it will be outlined in some detail.

In October, 1941, a committee was appointed by the late John A. McGeoch, composed of C. A. Strother, D. B. Stuit, and N. C. Meier (chairman) to organize a course in military psychology. With McGeoch as ex officio member, learning, clinical, personnel, and social psychology were hence represented, but as the work progressed responsibility devolved upon the chairman, the only member with military experience and contacts in the field. A portion of the course content—the section on morale—was offered during part of the 1941–42 academic year and the full course given both semesters in the following year.

As organized the course was designed to make the pertinent and usable principles and data of psychology (and closely related sciences) available to the interested student, particularly those in the Advanced ROTC. It featured motivation, morale, survival, adaptation of skills to military needs, and a comprehensive treatment of leadership both general and combat, with treatments also of learning, conflict behavior, psychological warfare, and adjustment. The catalog description is as follows:

103 *Military Psychology.* Data and principles of psychology applied to problems of modern warfare. Morale and other aspects of motivation; adaptation of civilian skills to military needs; factors in learning; perception, recognition, and illusion in field situations; psychological aspects of leadership, coordination, adaptability, and personality in military operations; problems of adjustment. No prerequisite. 2 semester hours.

The outline of the course, revised for 1943–44, is given below.

I. Why Men Fight; Group Conflict. An introduction, based on Stratton, Farago, and others, designed to afford a limited insight into frustration, nationalistic attitudes, resolution of frustration into conceptions of ideological conflict; and psychological preparation for war.

II. Psychological Aspects of Warfare. The human factor in fighting; intelligent military behavior; survival practices; strategy and psychological warfare; factors conditioning individual and group survival.

III. Psychological Preparation for Combat: Morale. Positive and negative incentives; re-directed innate drives; the enlistment of self-interest toward evoking maximum effort. Methods and practices for improving morale; expedients for sustaining morale under difficult conditions.

IV. Adaptation of Skills to Military Needs. Classification and placement of personnel; service requirements for special skills, capacities, abilities, and knowledge; requirements of infantry, paratroops, Airforce, motorized units, and communications; general field situations: observation, recognition and deception; camouflage.

V. Learning Military Skills. Factors in learning and forgetting; basic principles of military instruction; aids to effective teaching; development of good study habits, and self-improvement in learning ability.

VI. Leadership and Coordination. Theory of discipline; soldierly qualities; principles and traits of military leadership; considerations related to personality traits, courage, and the control over fear; leadership in higher command; problems of coordination; generalized aspects of leadership.

VII. Leadership in Combat Situations. Preparation for combat; safeguards against fear and morale deterioration; behavior on hazardous missions; control of rumor; prevention of panic impulses; adaptability and military tactical intelligence.

VIII. Adjustment to Combat Conditions and Stress. Delayed adjustment in training; individual differences in attitudes toward combat; preparatory psychological conditioning; fatigue and exhaustion; exhaustion neuroses; 'shell shock'—its nature, avoidance and treatment; other forms of incapacitation.

The course as now offered in its second year will probably include mostly 17- and 18-year old students taking the Basic ROTC course, with some unassigned Advanced ROTC (many of these have been returned to colleges pending availability of training facilities), Liberal Arts students, and a few women. It thus serves students anticipating induction, without competing with

the Introductory Course, and provides for those who do not desire to make psychology their major.

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BOOK REVIEWS

HALLOWELL, A. IRVING. The role of conjuring in Saulteaux society. Philadelphia Anthropological Society Publ., Vol. 2. Philadelphia: University of Pennsylvania Press, 1942. Pp. vii+96.

The aim of this volume is twofold. First, the author proposes to report the function of one form (non-inspired, according to E. M. Loeb) of shamanism within a group of the Ojibwa Indians. Second, he aims to compare these conjuring practices with those employed by other tribal groups. The author, to accomplish these ends, presents the results of exhaustive personal observations (1930–1940) made in a group of 900 Indians in the Lake Winnipeg region. These descriptions of tribal séances are accompanied by plates of the heretofore unphotographed conjuring lodge ("shaking tent"). Throughout the narrative the author endeavors to set forth the "magico-religious beliefs" of these people and, hence, to delineate the nature of Saulteaux cosmology in relation to their culture. In so doing he commendably avoids judging Saulteaux societal practices in terms of our own norms.

Of particular value for the psychologist, interested in social and anthropological problems, are the following: (1) the nature and content of dream experiences that serve as signs of supernatural appointment to shamanism; (2) the nature of religious beliefs and the animistic, anthropomorphic, transmigrative, and reincarnative presuppositions that underlie each; (3) the present decrease in the number of conjurers and the reduction in the number of séances held by respective shamans as related to changes in Saulteaux society; (4) the mechanics of the conjuring pattern itself. The latter is of particular interest to those students of objective and subjective metapsychics. In addition, the social psychologist will be interested to note that conjuring is held to serve a fourfold role in Saulteaux society. First, it humanizes and reinforces belief in Indian deities. Second, it provides means for applying sanctions to nonconformists. Third, conjuring lends an element of security to those in distress. Finally, it plays a dramatic role and serves as entertainment. For these reasons Hallowell holds that conjuring is an "index of the vitality of Saulteaux beliefs, attitudes and values."

For this reviewer the monograph is essentially descriptive and illustrative. The author has not associated psychological and sociological principles with his well-documented evidence. The question is raised concerning the nature of the conjurer's personality, for example, but the results of the administration of the Rorschach Test are not mentioned. No serious attempt is made to account for the so-called metapsychical phenomena evidenced at the séance. The author, however, does achieve his aims—those of describing, comparing, and delineating the role of conjuring in Saulteaux society *per se*. The volume is well annotated and the list of references is well arranged and inclusive.

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SIEBER, SYLVESTER A., & MUELLER, FRANZ H. The social life of primitive man. St. Louis, Mo. & London: B. Herder Book Co., 1941. Pp. xiii +566.

This book, intended as an introduction to the study of sociology and economics, rather than as a textbook of anthropology, presents the point of view of the *Kulturekriesschule* and is based, according to the authors, on *Völker und Kulturen* by Fathers Schmidt and Koppers.

The members of what was once the Vienna school of ethnology hold that the study of the social life of primitive peoples "who have preserved in isolation the cultural stages of the past through which man has progressed" gives a better understanding of pre-history than does the study of "graves, tombs, kitchen-middens and other excavated sites." The primitive tribes are considered as "living cultural wholes." "Here we find not only the same implements, utensils, and other material objects that prehistorical investigations have dug up from the past but we see them woven into functioning culture patterns." (2)

The culture circle is "a culture complex which embraces all the essential categories of human life, economic, social, political, aesthetic, ethical and religious." (10) While embracing a circumscribed geographical area, the culture circle is "also a biological concept since it is so intimately connected with the life of whole tribes, which are social and biological organisms." (11) The primitive culture circles were based on food-gathering. The authors have described the social institutions of primitives and the various primary and secondary cultures.

The main argument of the book seems to be as follows: According to St. Thomas, man is by nature a social being. "Therefore he enters into unions and associations with other individuals. The family itself is fundamentally an association. In the last analysis, every community and the whole human race is rooted biologically in the family." (48) Totemism and the matrilineal and patriarchal cultures, which went contrary to the principles of the natural (monogamous) family were destined to a short-lived existence. The struggle of lower (economic) classes to rise, wars, slavery, prostitution, and other forms of social evil, were due to the development away from the primitive form of family life. Of the great religions of history, Christianity alone did not tend to crystallize these "one-sided social phenomena." The coming of the Christian religion, which brought the return of "monogamy, indissoluble marriage, censure of infidelity of husband and wife, freedom of both parties to a marriage, restoration to a position of dignity for both woman and child," (483) changed the picture of culture in the Western world. Christ "set in motion principles that were to affect the social history of the world and gave to society the only foundation upon which it could securely rest and long endure." (483)

An appendix on symbiosis and cross-cousin marriage and a glossary of terms are helpful to those whose training in anthropology has been limited. The index would have been improved by more complete reference to the names of persons quoted.

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NOTES AND NEWS

MAX WERTHEIMER, professor of the graduate faculty of the New School for Social Research (New York City), died of a heart attack, October 12, at the age of sixty-three years. Dr. Wertheimer was head of the department of psychology at the University of Frankfurt from 1929 to 1933, and left Germany in 1933 to become one of the original members of the University in Exile. Dr. Wertheimer, after many years of work, had recently completed a major work in English on "Productive Thinking."

MARION L. MATTSON, director of the nursery school and associate professor of home administration and child psychology at Purdue University, died as a result of a railway crossing accident at Greencastle, Ind., November 1.

The September (1943) issue of the British Journal of Psychology, General Section, announces the death of KURT HUBER, professor of psychology in the University of Munich since 1926, who was beheaded for having inspired an anti-Nazi conspiracy.

The following promotions have been announced by Emory University (Ga.): M. C. LANGHORNE, and H. W. MARTIN, associate professors of psychology to professorships, and W. G. WORKMAN, assistant professor of psychology to associate professorship.

ROBERT P. FISCHER, formerly at Clark University, is now on the psychology staff of the University of Illinois.

HAZEL SCOFIELD CLAPP, formerly psychologist at Grasslands Hospital (Yonkers, N. Y.) has been appointed to the department of psychology at Briarcliff Junior College (Briarcliff Manor, N. Y.).

FRED A. REPLOGLE, for the past five years, personnel director, Macalester College (St. Paul), has joined the staff of Stevenson, Jordan, and Harrison, Inc., Management Engineers, Chicago, as consulting and clinical psychologist in servicing a wide variety of war industries.

A new course in personnel psychology, covering problems of selection and placement, including current applications of psychology to personnel problems of industry, the armed services and government agencies, is offered jointly during the autumn term by the Graduate School of Arts and Science and the Graduate Division for Training in Public Service of New York University at the Washington Square Center. The instructors, all associated with the Personnel Research Section, Classification and Replacement Branch, Adjutant General's Office, War Department, are LIEUT. COL. MARION W. RICHARDSON, officer in charge, Personnel Research Section; CAPT. ROGER M. BELLOWS, officer in charge, Technical Classification Unit, and DR. EDWIN R. HENRY, chief, Technical Classification Unit.

NOTICE

Because of restrictions on the use of paper it has been necessary to hold over several short papers and book reviews originally scheduled for this issue, for later publication.

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